FEDERAL RESERVE BANK OF NEW YORK
ECONOMIC POLICY REVIEW

SPECIAL ISSUE:

The Future of New York City

Charting an Equitable Recovery for All

Volume 29, Number 2
October 2023

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Contents

Key reasons for the existence of cities are the externalities created when people cluster together in close proximity. During the COVID-19 pandemic, such interactions came with health risks and people found other ways to interact. This article documents how cities changed during COVID-19 and considers how the persistence of new ways of interacting, particularly remote work, will shape the development of cities in the future. It first summarizes evidence showing how residential and commercial prices and activity adjusted at different distances from dense city centers during and since the pandemic. The analysis employs a textbook monocentric city model to demonstrate that two adjustments associated with remote work—reduced commuting times and increased housing demand—generate the patterns observed in the data. The authors then consider how these effects might be magnified by changes in

Introduction

Andrew F. Haughwout

On March 31, 2022, the Federal Reserve Bank of New York hosted "The Future of New York City: Charting an Equitable Recovery for All," the Bank's first public event with an in-person component since the onset of the COVID-19 pandemic two years earlier.[1] The global pandemic was a historic blow to both New York's people and its economy. This event focused on charting a path to an inclusive recovery, featuring presentations and discussions on topics including why New York City has thrived through pandemics, depressions, wars, and recessions; how to foster a recovery that reduces urban inequality; and big ideas from local innovators. The event was the culmination of nine months of planning and featured a long list of distinguished participants from the academic, business, government, press, and nonprofit communities.[2]

In this introduction to our special conference issue of the *Economic Policy Review*, we offer highlights of all the papers presented at the conference as well as the opening remarks and keynote discussion, and we preview the three presented papers that are included in full in the issue.

The day began with a welcoming speech by New York Fed President John C. Williams. Williams described the conference as marking a new era for how we think about living and working in the city. Explaining that the New York Fed had recently adopted and operationalized a flexible work model, he described this approach as best for the New York Fed, for the city, and for the Second Federal Reserve District because it supports direct engagement both within the Bank and between the Bank and the communities it serves.

Williams went on to remind the audience that the COVID-19 pandemic had hit New York City early and hard, leading to widespread hospitalizations and a devastating death toll. Huge numbers of jobs, especially in the leisure and hospitality industry, were lost amid general economic dislocations that were steeper and more sudden than any the city had ever seen. Since that time, the city has staged a quick, but incomplete, recovery: as of the date of the conference, city employment was roughly two-thirds its pre-pandemic level and was lagging

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The views expressed in this introduction are those of the author and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System.

https://doi.org/10.59576/epr.29.2.1-5

the nation. The job shortfalls were especially acute in sectors that depend on visitors and commuters, like leisure and hospitality. Nonetheless, with jobs and residents increasingly returning, Williams noted a palpable energy in the city.

The challenge of building an equitable recovery is the challenge of building a stronger economic foundation so that everyone can fulfill their economic potential, both in New York and around the country. Williams pointed to the need to tackle poverty and infrastructure gaps, two themes that would appear repeatedly in the rest of the day's proceedings. He noted that the New York Fed is proud to play a key role connecting and convening experts and stakeholders from around the city and the country, providing a catalyst for collaboration and creative solutions. Declaring that the Bank will continue its work in this arena, he invited these stakeholders to partner with us. "Together [we will] shape a bright future for this great city."

The first panel, which featured two academic economists and three practitioners, involved different aspects of how work locations are changing post-pandemic. Harvard Professor Edward Glaeser opened the panel with a discussion of how pandemics have historically affected cities, pointing out that cities had evolved to specialize in service-producing industries. In New York, for example, the early days of the pandemic struck workers in in-person services jobs, such as waiters and baristas, very hard, leading to high case and death rates in the "outer borough" neighborhoods where these workers lived. Many of these businesses closed quickly, leading to large job losses, especially in sectors that employ less-skilled urban residents. Massive federal intervention provided income support to these households, keeping them afloat and avoiding the worst-case scenarios that some were anticipating for the pandemic's economic effects on low-income households.

In order to assess the relative impact of the pandemic across cities, Glaeser and his coauthor David Cutler constructed an index of four key economic outcomes—two related to the housing market and two to the labor market. In this comparison, New York's steep job losses and housing market decline in the first year and a half of the pandemic place its performance second-worst among cities, just ahead of New Orleans. Sunbelt cities like Austin, Texas, are near the top of the performance index.

Glaeser concluded his remarks by reminding the audience that it would be a mistake to count New York out, as it has survived many crises in the past. Citing evidence ranging from the departure of the British in 1783 through the crash of 1929 to the deindustrialization of the 1970s, Glaeser described how New York has reinvented itself and remained a dominant city. Smart policy choices can help support the city as it transitions to a new steady state, probably one with fewer offices and more residential activity.

The second panelist, Professor Nicholas Bloom of Stanford University, focused on the likely future of working arrangements, in particular how this future could affect residential locations and demand for office space in New York. Bloom began by noting a fivefold increase in the number of days worked fully at home, from 5 percent to 25 percent of days worked, since the beginning of the pandemic. He said that hybrid workers now make up 29.6 percent of the workforce, while just 55.6 percent of workers are in-person full time. A key question for the future of New York is whether these arrangements will "stick," and Bloom's answer is a resounding "yes." Citing evidence from surveys of employers and employees that he and his coauthors have conducted, Bloom noted that hybrid work has benefits for both groups: employers get more work from their employees along with a small positive effect on productivity, while workers get more free time and express a willingness to pay for the

work-from-home (WFH) option equal to 8 percent of their pay. A remaining challenge is to get the benefit of at least occasional face-to-face interactions in the office while preserving the value of the WFH option. These considerations led Bloom to predict that the post-pandemic workplace will be a structured hybrid environment, with firms indicating which days are to be worked in the office and which have a WFH option. These changes will portend only modest reductions in firm demands for office space. As of the conference date, firms were predicting only about a 1 percent reduction in their total office space, in the face of much larger reductions—in the neighborhood of 40 percent, or two days a week—in employee use of office space.

Bloom's data on home values suggest that it is people, not firms, that are moving out of city centers, as the need to be close to work to economize on commute time is relaxed by hybrid and WFH. In support of the argument, he showed a map revealing what he and his coauthors have dubbed the "Donut Effect": reductions in home prices in the center of New York coupled with increases in the suburban ring. He predicted a 5-10 percent reduction in population for New York, coupled with a substantial reduction in the number of office workers in the city on a given day. This reduction in office workers is a threat to commuter-supported businesses, tax revenues, and the business model of public transit agencies, all of which will be a big concern.

The ensuing discussion included Alexander Heil, Chief Economist at the Citizens Budget Commission, and Chris Herd, Founder and CEO of FirstBase. It was moderated by Steve Todd, Nasdaq's Global Head of Workplace and Founder of Open Sourced Workplace.

The lively and provocative discussion covered many points, with the panelists generally agreeing that the hybrid and WFH arrangements were here to stay. This new reality presents major challenges for the transportation industry, which needs better mechanisms to match supply and demand, although this may be politically difficult. These changes also provide a challenge for urban service workers, many of whom rely on commuters to spend in restaurants and on other consumption opportunities in the city. While constraints in firms' ability to adjust their use of space make a major realignment in the office sector unlikely, an adjustment will still be required, and this adjustment will be made smoother if policy can support more flexible uses of space. Chris Herd indicated that he could imagine a future with considerably less connection of workers to cities, given that WFH during a pandemic, when people are homeschooling their kids and not able to take advantage of the extra free time and close proximity to friends, likely understates the value of WFH in a more typical environment. While this suggests that WFH and detachment from commuting could grow further, Herd views New York, with its many attractions, as likely to remain a "great place to be." During lunch, Jack Gutt, the New York Fed's Head of Communications and Outreach, led a discussion with Christopher Coes, Principal Deputy Assistant Secretary for Transportation Policy at the U.S. Department of Transportation, and Tom Wright, President and CEO of the Regional Plan Association. The discussion focused on transportation planning and policy in the region.

These discussions dovetailed perfectly with the day's other two panels, which featured the papers included in this special conference volume of the *Economic Policy Review*. In the first paper, Gilles Duranton and Jessie Handbury offer a model of the ways in which hybrid work affects the level and location of activity in a city. Starting from a standard urban model, they draw on the most recent evidence to show how key features of hybrid work—reduced commuting cost, coupled with an increase in the demand for residential space—might be expected to affect cities. The paper provides an outstanding lens through which to consider

what urban economics can tell us about how the changes in work arrangements described in the morning panel may play out; it is bound to be cited in the future as an early look at how the various factors could evolve. In the conference, the authors were joined by Marc Morial, President and CEO of the National Urban League, and Kathy Wylde, President and CEO of the Partnership for New York City, in a discussion moderated by *Wall Street Journal* Reporter Lauren Weber. The practitioners brought insights from their own work to add to the discussion.

The third panel focused on the next two papers included in this volume. The first, by Ingrid Gould Ellen and Noah Kazis of New York University's Furman Center, provides a detailed look at the potential for office–residential conversion to relieve the city's affordable housing shortage. The paper was quite prescient, as a great deal of academic and policy discussion focused on precisely this question in subsequent months. In the second, Lance Freeman of the University of Pennsylvania contributes a piece on racial equity planning, an important reminder of the need to incorporate explicit equity criteria into zoning changes like those discussed in all three panels if cities are to improve outcomes for those most in need. The discussion, led by Andrew Haughwout of the New York Fed's Research Group, included Rafael Cestero, CEO of the Community Preservation Corporation, and Christine D'Onofrio, Director of Poverty Research for the Mayor's Office for Economic Opportunity. Both brought their experiences to bear on these two related papers, and all agreed on the importance of making progress in this area.

Notes

[1] View the event page, including agenda and session recordings, at https://www.newyorkfed.org/newsevents/events/regional_outreach/2022/0331-2022.

[2] See the full list of speakers at https://www.newyorkfed.org/newsevents/events/regional_outreach/2022/0331-2022#speakers.

Covid and Cities, Thus Far

Gilles Duranton and Jessie Handbury

OVERVIEW

- A key story of the COVID-19 pandemic was the shift to working from home, an arrangement that was once unusual, by necessity became widespread, and persists for many even as the health crisis subsides.
- This study considers the effects of this shift on property prices and the spatial and functional differentiation of cities as those able to work remotely reassess their housing choices and push outward from city centers.
- Adapting a textbook "monocentric" model of resource allocation within a city, the authors provide a framework for quantifying the effects of the work-from-home shock.
- They extend the analysis to consider how these effects might be magnified by changes in the mix of urban amenities that cities can offer, while also addressing the implications of the work-from-home shift for wages, worker productivity, and the strength of agglomeration forces.

The use of cities has changed during the COVID-19 pandemic. But how will cities develop as the immediate health risks associated with the virus subside? To provide insights on this issue, we consider the impact of the pandemic on how people want to use space in cities and how these changes in the use of cities, in turn, shape the opportunities these cities offer, both as places to work and places to live.

We first summarize recent evidence about the evolution of housing prices, commercial property prices, and population in cities from the onset of the pandemic to early 2022. We observe that residential prices increased, on average, while commercial property prices decreased. Beneath these averages, we find important differences in price changes within cities: residential prices increased in the suburbs relative to neighborhoods closer to city centers, where prices, in some cases, declined. This flattening of the property price gradient is associated with a significant relocation of residents and businesses away from downtowns. Across cities, we have, so far, only observed minimal changes with small and temporary population outflows away from the largest cities.

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https://doi.org/10.59576/epr.29.2.6-52

Nonetheless, there are hints of more persistent population changes as the housing supply begins to adjust.

We argue that the COVID-era price changes and within-city migration patterns result from work-from-home (WFH) arrangements. Working from home changes the household location decision in two ways: the first is a reduction in commuting costs and the second is a reduction in, or tax on, the space one can consume at home to make room for an office. We refer to these as a "commuting dividend" and a "home-office tax." Taken together, these two forces imply an increase in the aggregate demand for housing, since households want to counterbalance the home-office they had to set up, and they find more remote locations relatively more attractive. As long as WFH stays, these forces will remain at play.

The COVID-era shifts we observe in the price gradient are, to a large extent, textbook illustrations of what the simplest urban models would predict following the twin WFH shocks of the commuting dividend and the home-office tax. They also reflect what more recent models would predict from a reduction in the amenity value of downtowns, induced by the health risks associated with the indoor activities that characterize downtowns. Many of these changes are ongoing. We use the textbook model to interpret the current situation, but it also provides us with a framework with which to form ideas about how future changes may look.

We find that a simple urban model where residential choices depend only on housing and commuting costs matches the short-run response to the twin COVID shocks that we observe: When most of the workforce is working from home, prices increase in the suburbs and decline near city centers. We then adjust the model to allow for the medium-run scenario where only some workers, typically college-educated, continue to WFH, but everyone else resumes commuting full-time. In this specification, we match the medium-run response of prices to increases citywide: prices increase everywhere because the skew in the commuting dividend toward the higher-paid college graduates results in a larger increase in aggregate housing demand.

Changes in urban amenities amplify all of these effects. We expect household demand for restaurants, bars, gyms, salons, and other nontradable services to rebound as the health risks of engaging in these indoor activities subside. However, these amenities may spread out more post-pandemic so that they locate closer to where their customers are. The advantage of urban centers in providing a wide variety of these establishments relies crucially on the daytime workforce. So, if downtowns cease to be great places to work, they may also stop being such great places to live.

We also consider the effect that WFH has on the strength of agglomeration forces in cities. To a large extent, the agglomeration economies associated with the physical proximity of workers who learn from each other behave like local amenities. At the same time, these direct interactions are only one channel for agglomeration effects. Other channels, such as those that rely on the thickness of local labor markets or a dense network of input-output transactions, are less susceptible to change from WFH.

Finally, we return to the same model and allow for the long-run margins to operate. While obviously speculative, we expect that the twin shocks of the commuting dividend and the home-office tax will amplify the current trends in the longer run. More attractive downtowns are likely to enjoy a renaissance. We expect that the recovering downtowns will host more creative workers who go to work to benefit from exchanging with others. Because of their outward orientation and their spending power, these workers will energize downtowns and other concentrations of economic activity much more than the many workers who previously

showed up at work just because everyone thought they should. These centers of economic activity may turn out to be even more vibrant than they were pre-COVID. Since there are only so many of these creative workers whose jobs depend on human interactions, and since these workers can move to cluster in certain cities, perhaps not all downtowns will recover.

Meanwhile, housing supply will adjust to accommodate the increasing demand for housing by support workers who work from home the majority of the time and may demand a home office. Cities will likely expand physically to allow new residential construction. As the response of housing supply is likely to differ greatly across cities, "housing hungry" residents will relocate to cities willing to accommodate urban expansion.

1. COVID's Initial Impact on Cities

In the midst of the pandemic, economists have used (close to) real-time data to document how real estate prices and demand adjusted within and across U.S. cities in response to COVID-19.[1] We report findings up to early 2022 before changes in the macroeconomic situation started interfering with some of the features we document here.[2]

1.1 Suburban Migration

The U. S. Postal Service National Change of Address database shows households moving from downtown toward the suburbs in large U.S. cities at the onset of the pandemic. Ramani and Bloom (2021) use these data to show that the densest zip codes lost about 15 percent of their populations, while the least dense gained about 2 percent between February 2020 and January 2021. Gupta et al. (2022) document a similar shift in residential population toward the suburbs over 2020 in the thirty largest metropolitan areas. These changes are often referred to as a "donut effect," with renewed suburbanization and a partial hollowing out cities of their downtown residents. Liu and Su (2021) find evidence of adjustments consistent with such flows, including increased home searches and declining housing inventories in suburbs.

To put these figures in perspective, we note that the 2 percent population growth for less dense locations corresponds to the annual population growth between 2010 and 2019 of Dallas, Texas, the fastest growing large metropolitan area in the United States during this period. More striking, the 15 percent population decline for the densest locations exceeds the population loss of Pine Bluff, Arkansas, between 2010 and 2019. No other metropolitan area did worse than Pine Bluff, a struggling mid-sized city, during this period.

1.2 Migration across Cities

Across cities, the migration toward less dense cities has been less pronounced so far. Despite a much talked about exodus from the largest and densest cities early on in the COVID crisis, Haslag and Weagley (2021) find that only about 10 percent of long-distance moves are

COVID-related. This is perhaps because only a small minority of workers expect to remain fully remote.

However, more recent evidence is starting to emerge that between a quarter and one-third of moves are beyond commutable distance, four or more hours away from the workplace (Ozimek 2022). Brueckner, Kahn, and Lin (2023) also document a movement away from more productive counties where the mix of occupations is more amenable to WFH. With more workers planning to move away from relatively expensive cities with a strong WFH potential, this may be just the beginning of a significant trend. Eventually, both residents and jobs may move to cities where elastic housing supply makes living there more affordable. We return to these issues below as we seek to provide a framework within which these trends can be interpreted.

1.3 Rising House Prices and Flattening Urban Gradients

Mondragon and Wieland (2022) report that house prices grew by 23.8 percent between November 2019 just before the pandemic and November 2021. The same authors also argue that the increased demand for housing caused by the rise of WFH explains more than half of that growth. In related evidence, Gamber, Graham, and Yadav (2023) show that house price growth is stronger in counties where residents have spent more time at home owing to a more severe incidence of the pandemic.

This increase in housing prices is not homogeneous over space. The donut effect of residents moving from downtown to the suburbs is reflected in a drop in downtown rents and house prices relative to those in the suburbs. Between February 2020 and January 2021, Zillow's Observed Rental Index dropped by 20 percent in the top twelve central business districts relative to below-median-density zip codes (Ramani and Bloom 2021). See Chart 1 for an illustration. The corresponding relative drop in Zillow's Home Value Index was 15 percent. Gupta et al. (2022) show that the rent gradient flattened over 2020 by 0.032, with rents increasing by 12 percent and house prices increasing by 6.5 percent in suburban locations 50 kilometers from city centers.[3]

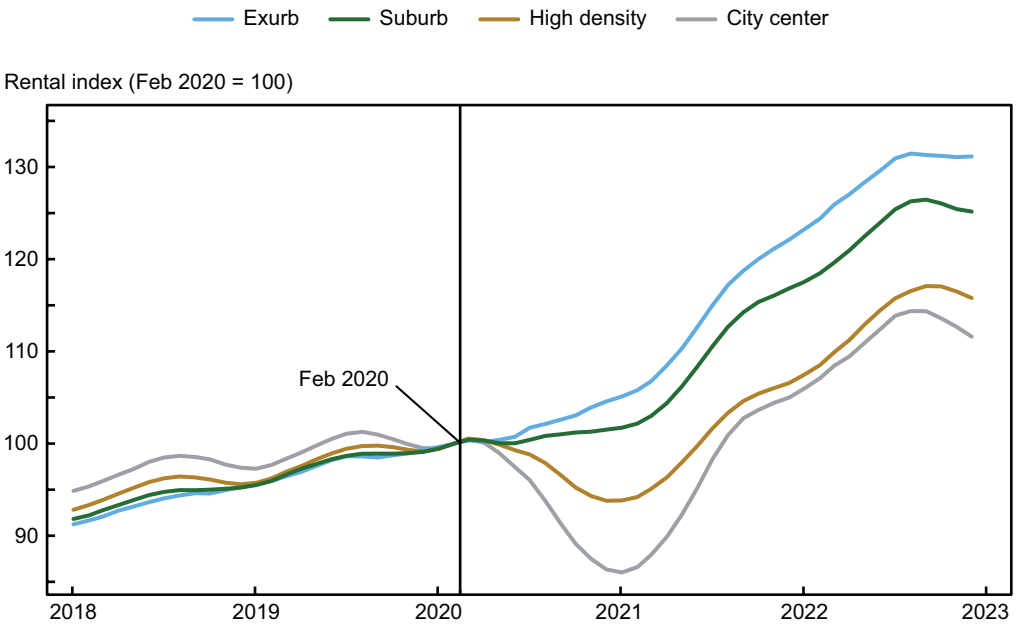
This flattening of house price gradients is also evidenced by Brueckner, Kahn, and Lin (2023). Consistent with these findings, D'Lima, Lopez, and Pradhan (2022) document declines in housing rents in denser locations and increases in less dense locations with stronger effects for smaller properties.

Importantly, Chart 1 shows that housing rents strongly recovered everywhere in the second quarter of 2021 until the summer of 2022 as the U.S. economy slowly reopened. Nonetheless, there is still a large differential between rents in the outer parts of cities which have increased by 15 to 20 percentage points more than in urban centers.

1.4 Flattening Commercial Rents

Rosenthal, Strange, and Urrego (2022) document a qualitatively similar, but smaller, decline in the commercial rent gradient during the summer of 2020. In transit-oriented cities, rents on new office and retail leases fell by over 30 percent within 10 miles of the city center but less in

Chart 1
Housing Rents in the Twelve Largest U.S. Cities



Source: Ramani and Bloom (2021, Figure 1), version updated by authors. Used by permission.

Note: Calculations are based on Zillow data for New York, Los Angeles, San Francisco, Chicago, Dallas, Houston, Miami, Philadelphia, Washington, D.C., Atlanta, Boston, and Phoenix by zip code population density.

outlying areas. This decline is concentrated within 0.5 miles of transit stations and is not observed to the same extent in car-oriented cities. These results are based on new leases signed, but the volume of leasing activity in this period was also depressed to around 50 percent of its pre-pandemic level.

To get a longer-run view of the market, Ling, Wang, and Zhou (2020) study how the value of commercial real estate adjusted in response to COVID. They show that the pandemic led to a decrease in the stock prices of public real estate companies with heavily exposed portfolios that persisted even after re-openings from local shutdowns. These adjustments to valuations indicate market expectations for further rent decreases and/or increased cash flow volatility.

These early responses of public markets have since been observed in the market for office space, which are seeing rising vacancies and now flat or declining rents. Gupta, Mittal, and Van Nieuwerburgh (2022) document an 8 percent decline in revenue for the entire office sector in the United States between early 2020 and late 2021. This decline can be entirely accounted for by fewer leases rather than by lower rents on existing leases. Although average rents on new leases decreased sharply, rents on in-place leases increased in accordance with built-in rent escalation clauses.

Looking forward, the large increase in vacancies that resulted from difficulties in finding new tenants, fewer renewals, and partial renewals will likely put further downward pressure on commercial rents. Vacancies may also worsen if many firms decide not to renew their leases, putting further downward pressure on rents and slowing price discovery.[4]

The lower demand for office space is foreshadowed by sharp declines in occupancy rates of office buildings, a natural consequence of increased WFH. As of May 2022, Gupta, Mittal and Van Nieuwerburgh (2022) report an occupancy rate of only about 50 percent for the ten largest office markets in the United States and find a strong negative correlation between office demand and the share of remote jobs in new listings. Declining occupancy rates in downtown office buildings and WFH also correlate naturally with a sharp reduction in transit ridership (Qi et al. 2021) and a still sizeable reduction in car travel of more than 20 percent for commutes to downtowns in the United States in 2021 (Pishue 2021).

2. Will These Patterns Persist?

The patterns documented during the height of the pandemic could be attributable to the fact that households spent more time at home. This shift was not just about remote work, but it was also attributable to a move away from leisure activities at indoor commercial establishments due to health concerns. As these health concerns abate, we have seen these leisure patterns outside the home return to their pre-pandemic levels, while remote work appears to be persisting.

Kastle's "Back to Work Barometer," for example, shows that physical office occupancy remained below 45 percent of its pre-pandemic level across the largest ten U.S. cities as of May 2022, while dining activity and travel through airport checkpoints, as measured by OpenTable and the Transportation Security Administration, both returned to over 80 percent of pre-pandemic levels by that time.[5] These data support the predictions from survey-based evidence that WFH will stick (Barrero, Bloom, and Davis 2021a; Bick, Blandin, and Mertens 2022; Abel, Bram, and Deitz 2022). Further supportive evidence is also provided by Delventhal and Parkhomenko (2022).

2.1 An Interpretive Framework

To interpret the data, we consider the WFH shock in a model of housing in cities in the tradition of Alonso (1964), Mills (1967), and Muth (1969) as presented in Duranton and Puga (2015). We start with stark assumptions to highlight the main trade-offs. We consider one city that produces its consumption good downtown (often referred to as the central business district, or CBD) where all jobs are concentrated.[6] We normalize the price of this consumption good to 1. Residents also consume housing, which is supplied competitively along a segment between downtown, 0, and the urban fringe, $\bar{x}$. For now, we take the supply of housing and its distribution between the center and the urban fringe in the city as given.

Preferences can be represented by a utility function $u(h, z)$ where utility is obtained from consuming housing, h, and other goods, z, which we take as the numéraire. Utility is increasing in both arguments (and we assume strict quasi-concavity).

A resident living at distance x to downtown incurs a commuting cost τx. This leaves this resident with a disposable income of $w - \tau x$ for expenditure on housing and other goods. Letting $P(x)$ denote the rental price of housing at a distance x from the center, this resident's budget constraint is thus $w - \tau x = P(x)\, h + z$. Expressed in words, after paying a commuting

cost τx, a resident at distance x from the center buys a quantity h of housing ("the size of the house") at a price $P(x)$ per unit and spends z on other goods.

So, at a given location, a resident is facing a consumption problem having to choose between housing and other goods. This appears very similar to the standard consumer problem studied in intermediate microeconomics after replacing the traditional "pizza" and "beer" by housing and other goods.

There are two differences, though. The first is that the price of housing at each location is endogenously determined (and to be solved for as well). The second difference is that residents also choose where to live. Assuming for now that all residents in the city are identical in income and preferences and that they are freely mobile within the city, they must achieve the same level of utility $\underline{u}$ everywhere. This is usually referred to as a "spatial equilibrium." In essence, nobody in the city can increase their utility by moving to another location. Housing prices adjust to that effect.[7]

Finally, let us assume that there is no movement into and out of the city; that is, the city is "closed." To a first approximation, this assumption is consistent with what we observed during the first two years of the pandemic: flows of migrants between cities were small. We understand that WFH does not in most cases allow residents to relocate anywhere they would wish. They still need to get to their jobs, at least some of the time.[8]

We solve for the consumption choice between housing and other goods in the usual way. That is, a resident will allocate her expenditure so as to equalize the bang-for-the-buck across the two goods:

$$\frac{u_h}{P} = u_z. \tag{1}$$

Equation (1) shows that the marginal utility per dollar for housing, u_h is equal to the marginal utility for other goods u_z (recall that we normalized the price of other goods to 1).[9]

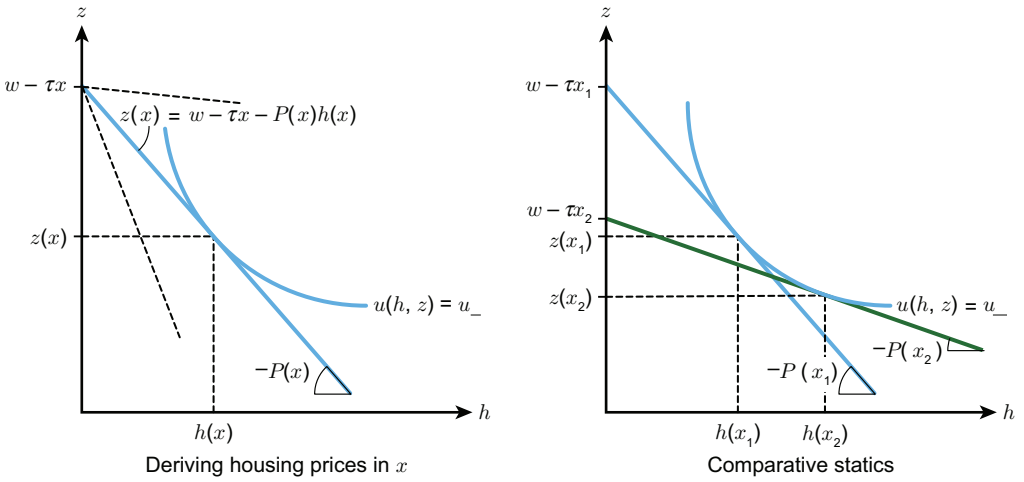
We assume residents will choose their residence optimally, knowing their consumption choice at each location. The key optimality condition here is that a resident who moves slightly farther away from downtown must still enjoy the same level of utility. To satisfy this condition, a small increase in distance to the center $d(x)$, which increases commuting costs by $\tau\, d(x)$, must be exactly offset by declining housing costs $dP(x) \times h(x)$, where $dP(x)$ is the change in the price of housing per unit.[10] We can thus write the following expression:

$$P'(x) = -\frac{\tau}{h(x)}. \tag{2}$$

This condition, known in the literature as the Alonso-Muth condition, indicates that there is a negative house-price gradient in cities as one considers dwellings farther away from the center. Importantly, this gradient is equal to the cost of commuting per unit distance divided by the consumption of housing.

The left panel of Exhibit 1 provides an illustration of the mechanics associated with equation (1) at the spatial equilibrium. The consumption of housing is represented on the horizontal axis and that of other goods on the vertical axis. The indifference curve $u(h, z) = \underline{u}$ represents all the combinations of housing and other goods that allow a resident to achieve

Exhibit 1
A Graphical Representation of the Monocentric Model



Note: These figures borrow from Duranton and Puga (2015) and were inspired by Brueckner's (1987) earlier work.

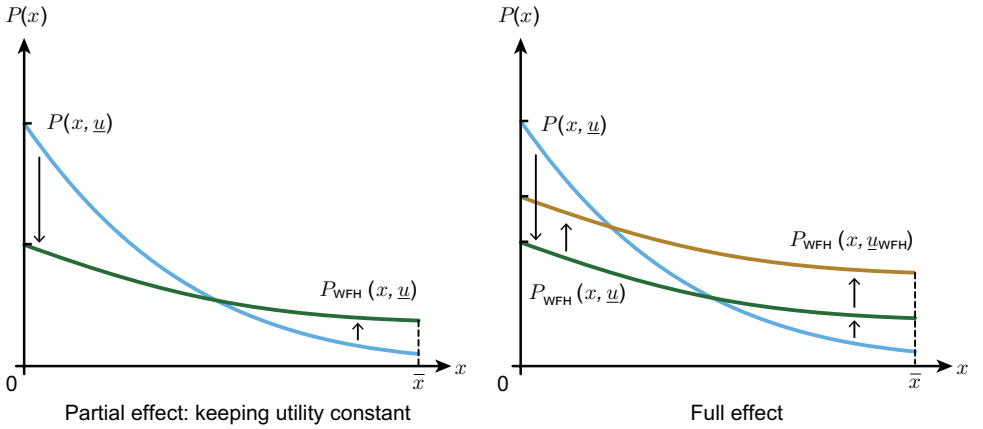
utility $\underline{u}$. Then, if we consider a resident living in x, the budget constraint of this resident is given by the line $z(x) = w - \tau x - P(x)h(x)$. The slope of this budget line is $-P(x)$. As the price of housing increases, the budget line rotates clockwise around its intercept $w - \tau x$. If the slope of the budget line is very flat as for the upper dashed line in the left panel, residents in x can attain a level of utility higher than $\underline{u}$. Then, residents from other locations in the city will bid up the price of housing until the budget constraint is just tangent to the indifference curve for $\underline{u}$. At the point of tangency, we can read, for the resident living at location x, the consumption of housing $h(x)$ on the horizontal axis and that of other goods $z(x)$ on the vertical axis.[11]

To illustrate the workings of equation (2), the right panel of Exhibit 1 considers two locations x_1, closer to the center, and $x_2 > x_1$, farther away. At x_1, the price of housing, $P(x_1)$, is reflected by the slope of the budget constraint with intercept $w - \tau x_1$ that is tangent to the indifference curve $u(h, z) = \underline{u}$. Again, the tangency point allows us to read the consumption of housing $h(x_1)$ and other goods $z(x_1)$ for this resident. We can repeat the same exercise for the other resident in x_2. For this second resident, the intercept of the budget line is lower because of the higher commuting cost in x_2. As a result, the budget constraint for x_2 must be flatter and must involve a lower housing price for the budget line to be tangent to the indifference curve. It is also the case that the consumption of housing is higher in x_2 relative to x_1, whereas the consumption of the numéraire is lower in x_2.

2.2 Introducing Work from Home

We can now use this model to assess the effects of an increase in WFH. We start with a situation where WFH affected most households and, for now, we ignore differences between skill groups. Not having to commute every day, unlike the norm prior to the pandemic, implies a reduction in commuting costs.[12] At the same time, moving the office inside the home implies devoting part of what was a resident's living space to a home office. When working from home,

Exhibit 2
Effects of Lower Commuting Costs on the Rent Gradient



Notes: The illustration reflects a 30 percent reduction in commuting costs, equivalent to working from home two days per week instead of none. See Appendix 1 for derivations and the main text for details about the quantification.

the place of work might be more convenient but it still takes space. It is as if housing space at home is taxed. This "tax" could be either a fixed amount, say 100 square feet, or proportional to the size of the house, say the home office h_o is 5 to 10 percent of h.

Let us explore these two changes in light of the model. We consider a short-run situation where people can move within the city and adjust their consumption of housing space. The urban fringe remains the same and housing supply inside the city is, for now, fixed. We also ignore any change in productivity or in amenities associated with work from home.

The "Commuting Dividend"

People who WFH do not need to commute to work as frequently and, therefore, face lower average commuting costs. The effect of lower commuting costs is most directly apparent in condition (2). A lower cost of commuting τ flattens the housing-price gradient through a direct effect on the numerator in equation (2). With lower commuting costs, housing closer to the urban fringe enjoys cheaper access to downtown and its price increases. Housing closer to downtown now offers a smaller accessibility advantage and its price goes down. What we called a flattening of the housing-price gradient in Section 2 is really a rotation counter-clockwise. We provide a visual representation of this rotation using the functional forms and parameter values we propose below. The left panel of Exhibit 2 represents the effect of lower commuting costs, keeping utility constant.

Because the city remains "closed" to new residents for now, a lower cost of commuting also implies an income effect whereby residents all enjoy a higher disposable income after spending less on commuting. In turn, a higher disposable income implies a greater demand for both

housing and other goods. Because housing is in fixed supply at each location, its price increases. So after rotating the house-price gradient, housing prices also increase. This change is represented in right panel of Exhibit 2.

Despite this increase in housing prices, residents are collectively made better off by lower commuting costs. Downtown residents enjoy a higher level of utility just like everyone else in the city. To achieve this, the price of housing at the center must be lower than it was initially. In turn, households residing at the center each consume more housing than they did previously and the central city population density falls. By contrast, more expensive housing prices in the suburbs are synonymous with less consumption of housing per suburban resident and thus a higher suburban population density than before the WFH shock.

Lower commuting costs provide a parsimonious explanation for the changes we describe above. With a constant population and a constant stock of housing, the city-level average housing consumption is unchanged but the housing-price gradient shifts: housing costs decrease in the city center and increase in the suburbs. These patterns are consistent with the short-run price response to the WFH shock in the first year of the pandemic, when urban expansion was indeed limited.[13] Changes in housing prices also imply diverging outcomes for renters and (suburban) owners.[14]

The Home-Office "Tax"

Lower commuting costs are the sunny aspect of WFH but there is also a darker side. Part of what was "home" is now the office. Recall that we model this shift as if WFH is taxing away part of home, say, by a fraction t. A simple way to represent this tax is to argue that for a purchase of h^T units of housing, a resident only gets to enjoy $h = (1 - t)h^T$ with the rest, $h_o = th^T$, being devoted to a home-office from which no utility is derived. Let us call h^T total housing and h "effective housing." So utility is still $u(h,z)$ but the budget constraint is now such that $P(x)\, h^T(x) + z = w - \tau x$. Since $h = (1 - t)h^T$, we can rewrite the budget constraint as $\frac{P(x)}{1-t}h(x)+z = w-\tau x$. Hence, this tax is equivalent to an increase in the price of effective housing for which demand will decline. The first effect of the home-office tax is thus to reduce the amount of housing available for enjoyment by a factor of $1 - t$, which in turn reduces utility.

Turning to the demand for total housing, we note that if the price elasticity of the demand for *effective* housing is below 1 (that is, housing demand is relatively inelastic), demand for *total* housing will actually increase with the home-office tax. The main intuition behind this result is the following. When a good is inelastic, a price increase leads to a less than proportional reduction in the quantity consumed and thus an increase in the expenditure on this good. A 10 percent home-office tax may thus lead residents to reduce their consumption of effective housing by 5 percent; Yet, with a home office representing 10 percent of residents' consumption of total housing, this tax still implies a 5 percent increase in the consumption of total housing. In practice, with 10 percent of a dwelling now devoted to a home office, residents will want to increase their consumption of total housing, for instance, to regain a small guest bedroom after losing it to a home office.

Conversely, if the price elasticity of the demand for housing is above 1 (that is, housing demand is relatively elastic), the home-office tax will instead lead to a decline in housing expenditure and a lower consumption of total housing. In the particular case of a unit price elasticity of the demand for housing, housing expenditure remains constant and households keep demanding the same quantity of total housing, since the price increase associated with the tax will be met with a proportional reduction in the demand for effective housing, leaving the taxed part of total housing to accommodate the home office.

The literature is not definitive on the price elasticity of housing demand. For tractability in the analysis above, we impose a value of 1. If demand for housing is instead inelastic, as suggested in the still-preeminent Hanushek and Quigley (1980), and supply is fixed, then the effect of the WFH dividend will be amplified by higher prices.[15]

Discussion

To summarize, the commuting dividend implies a flattening of the bid-rent curve, the suburbanization of residents, and a further shift up in prices caused by a higher disposable income with reduced commuting costs. The WFH tax reduces utility as the home office is not valued as part of household consumption. As we discuss below, housing is perhaps modestly inelastic so that this tax may increase housing prices further, but only by a modest amount.

Before turning to the quantification of our model, let us briefly relate our work to other attempts at evaluating the effects of WFH on cities. Gokan et al. (2022) develop a model closely related to ours in spirit. We view their work as a complement to what we do. Their model does not allow for changes in the quantity of housing per household and they do not provide as detailed a quantification as we do. On the other hand, they close the link between local amenities and the employment and wages of the workers providing them. Kyirakopoulou and Picard (2021) provide a rich model of urban land use where downtown locations emerge endogenously from spillovers between different types of workers. While we discuss productivity issues separately below, we note that their framework shares many of the features and properties that we highlight here but its complexity makes it less amenable to a detailed quantification. Delventhal, Kwon, and Parkhomenko (2022) use a very different framework inspired by Ahlfeldt et al. (2015) with no predetermined downtown but where the city remains enclosed within a fixed urban fringe. Despite this very different setting, their model also generates features similar to those highlighted here and below, where we extend our approach to deal with urban sorting.[16] Brueckner, Kahn, and Lin (2023) explore the effects of a possible decoupling between a city of residence and a city of work. While these are important issues looking forward and we discuss them below, they are less relevant to explaining the evolution of the housing market over the last two years, our main concern here.

2.3 A Quantification

To provide a sense of the economic magnitudes of these effects, we consider an example with specific functional forms that we calibrate to reasonable estimates for its key parameters.[17]

Baseline Calibration

We consider the particular case where utility is Cobb-Douglas in housing and other goods $U(x) = h(x)^{\alpha} z(x)^{1-\alpha}$. We can take $\alpha = 1/3$ as a first approximation for the share of housing in utility. According to the U. S. Bureau of Labor Statistics (2021), American households devoted 32.8 percent of their income to housing (and 17.0 percent to transportation) in 2019.[18]

To set up a reference city, we note that after ranking U.S. metropolitan areas by their 2010 population, the median metropolitan resident lives in Tampa, Florida, with a population of 2.4 million and a distance $\bar{x}$ between its center and its urban fringe of close to 60 kilometers.[19]

Relative to the baseline model, we introduce a small change to the specification of commuting costs. Rather than assume that commuting costs increase linearly in distance, x, we make them proportional to x^{γ}. Empirically, households' distance to work and total vehicle-kilometers driven increase less than proportionately to distance to the center. Taking a value of γ much below 1 turns out to be an important adjustment.

Duranton and Puga (2022) estimate a value of γ of about 0.07 when exploiting annual driving distance for all trips in U.S. metropolitan areas. Interestingly, they estimate a similar gradient for housing rents as predicted by the analogous equation to expression (2) when commuting costs are proportional to x^{γ} rather than x. Given our focus on commuting and WFH, it is more appropriate to consider only distance driven to and from work. Replacing the total distance driven with commuting distance as dependent variable in the Duranton and Puga (2022) regression, we estimate a higher value of γ of about 0.21.

Then, we set total daily commuting distance to $x^{0.21} \times 2 \times 10$ kilometers where distance to the center x, elevated to the power 0.21, is multiplied by two commutes a day and by 10 kilometers, the commute of a resident living 1 kilometer away from the center. This specification matches the data well.[20]

To value these commutes, we first note that the cost of commutes sums an implicit value of travel time and the cost of operating a vehicle. Starting with the valuation of time, we first calculate daily commuting time for each resident in our model by dividing commuting distance by the U.S. average commuting speed of 43 kilometers per hour based on data from the National Household Travel Survey (NHTS). Then, to set a value of time, we note that there is a large literature on the subject given its importance of valuing time saved as a result of transportation improvements. Small (2012) provides an extensive review and supports the traditional consensus value of 50 percent of the wage. He also highlights the heterogeneity in these valuations, including results suggesting that perhaps commutes should be valued more highly than other trips. In recent work, Le Barbanchon, Rathelot, and Roulet (2021), Buchholz et al. (2020), and Kreindler (2023) obtain higher estimates. To remain conservative, we choose a value of time of about 60 percent of the wage, slightly above the traditional consensus but below some of the most recent estimates.

Then, for the cost of operating a vehicle, we rely on the Internal Revenue Service's mileage rate of 56 cents per mile or 35 cents per kilometer. At a speed of 43 kilometers per hour, this represents $15.05 per hour. To sum these two quantities, we consider a worker making the median wage of about $42,000 per year in 2019. This corresponds to $21 per hour with 250 workdays per year and 8 hours of work per day. Hence, the cost of operating a vehicle during an hour represents about 72 percent of the median wage during this hour. Summing

the value of time when commuting and the cost of operating a vehicle, we end up valuing the total cost of commuting time at 1.30 times the wage.

This quantification predicts that residents at the urban fringe 60 kilometers away from the center commute for about an hour and 6 minutes daily. Their total cost of commuting corresponds to close to 18 percent of income. For residents located 1 kilometer away from the center, the cost of commuting falls to about 7.5 percent of income.

Additionally, we need to take a stance about the distribution of the supply of housing and specify how it varies with distance to the center. We assume that housing supply is proportional to x^{σ}. Empirically, we choose a value of σ of 0.50 after estimating how the supply of housing increases with distance to the center using data from the American Community Survey as detailed in Appendix 3.

Next, we feed parameter values for our representative city, a hypothetical Tampa, into our model. As just discussed, we consider a distance to the urban fringe of 60 kilometers, 2.4 million residents, and a wage of $21 per hour, assuming a travel speed of 43 kilometers per hour, a total cost of travel of 1.3 times the wage, an elasticity of the supply of housing with respect to distance to the center of 0.5, an elasticity of commuting distance with respect to distance to the center of 0.21, and a share of housing of 0.33. This parameterization of our model allows us to generate a (counterfactual) price of housing for each location between the city center and the urban fringe. See Appendix 1 for a full set of derivations.

To have a sense of what our model predicts, we regress the log *predicted* housing price on the log distance to the center for a hypothetical pre-COVID situation where all residents commute to work every day. We estimate an elasticity of -0.096 (or -0.102 when we weight each level of distance to the center by its population).[21]

This elasticity of -0.096 predicted by the model is slightly larger (in absolute value) than the corresponding elasticity of -0.077 estimated by Duranton and Puga (2022) for *actual* housing values in all U.S. metropolitan areas. This differential is consistent with the tendency, in the data, for larger metropolitan areas to have larger elasticities. Our predicted elasticity fits well what is observed for cities with the population similar to our reference city, Tampa.[22]

For the entire city, the cost of commuting is predicted to be equivalent to 15.6 percent of income. If commuters are located following the distribution predicted by our model, the cost of commuting for someone located half way to the urban fringe, or 30 kilometers away from the center, is equivalent to 15.4 percent of income. This figure is slightly less than the mean commuting cost because more people live in the outer rings.

Quantitative Impact of the Twin COVID Shocks

To assess the COVID dividend, we compare the situation with no WFH we just described with one where workers commute only three and a half times a week instead of five, which corresponds to a decline in commuting costs of 30 percent. This figure is in line with the long-term prospects for WFH discussed above. This change in WFH implies a flattening of the land gradient. For the same baseline city, we now estimate an elasticity of predicted housing prices to distance to the center of -0.064, a decline of about one-third relative to the

situation with no WFH. This flattening of the rent gradient by about 0.032 is exactly the same as the flattening of the price gradient for residential rents for the COVID shock estimated by Gupta et al. (2022) for the thirty largest U.S. metropolitan areas.[23]

Ignoring any residential change and any equilibrium effect, a 30 percent reduction in commuting is equivalent to a gain in real income of 5.4 percent for the resident at the urban fringe (60 kilometers away from the center), 2.3 percent for the resident living 1 kilometer away from the center, and, of course, no change for the resident living right at the center. With commuting costs being equivalent to 15.6 percent of city income, a 30 percent rate of WFH would bring the cost of commuting to an equivalent of 10.90 percent of city income and imply the equivalent of a 4.7 percent increase in real income for the city. When we allow for residents to adjust their location and their consumption of housing, commuting now represents 10.92 percent of city income instead of 10.90 percent in the absence of any change. These figures imply that the re-sorting of residents and their move toward the suburbs implies only a minimal change in commuting costs and does not undo the WFH commuting dividend, keeping in mind that we do not (yet) allow the city to expand. Because of the greater suburbanization of city residents, land rents also increase. This increase represents slightly less than 1 percent of city income. In turn, this result implies that most of the 4.7 percent increase in city (equivalent) income accrues to commuters.

We can also compute the change in housing prices at the center after the rise in WFH: a 10.3 percent decline. This figure is close to but slightly less than the 15 percent decline in central prices estimated empirically by Ramani and Bloom (2021) for early 2021 during the peak of the pandemic when the rate of WFH may have been higher than our assumed level. With the flattening of the land gradient, this 10.3 percent decline in downtown housing prices morphs into a predicted 8.5 percent increase in housing prices at the urban fringe. The two changes even out close to the center, about 7 kilometers away from it, consistent with the empirical findings of Ramani and Bloom (2021).

Turning to the home-office tax, Stanton and Tiwari (2021) compare households in the same housing market (defined as Public Use Microdata Areas, or PUMAs, each of which have a population of around 100,000). Prior to COVID, they find that for the average renting household with at least one adult who works remotely, expenditure on housing was between 6.5 and 7.4 percent higher than similar nonremote households in the same area. Among owners, mortgage payments and property taxes were between 8.4 and 9.8 percent greater for remote households.[24]

Overall, according to Stanton and Tiwari (2021), additional housing expenditure associated with remote work represents 3.8 percent of household income (and 2.4 percent when accounting for lower vehicular expenses). With housing representing about one-third of expenditure, it is reasonable to associate remote work with about a 10 percent tax on housing. This tax is almost surely highly regressive.[25]

In our model, because of our Cobb-Douglas assumption for the demand for housing, the demand for total housing is unchanged. This leaves the price of housing unchanged by residents enjoying less of it. The home-office tax is thus equivalent to scaling down the utility of residents by a factor of $(1 - t)^{\alpha}$, which corresponds to about a 3.5 percent reduction in income with a 10 percent home-office tax and $\alpha = 1/3$. This tax, however, does not affect the urban equilibrium in any other way. This loss from the home-office tax offsets a large part of the 4.7 percent increase in equivalent income in the city from the commuting dividend,

keeping in mind that renters also pay higher rents corresponding to about 1 percent in city income. Overall, these changes are about zero for renters and a small positive for homeowners. These owners of course also enjoy an increase in their property values.

3. COVID and Spatial Sorting

Not all jobs can be done remotely and so not all people have the option to work from home. In particular, the increase in remote work has disproportionately affected college-educated workers who earn higher incomes (Mongey, Pilossoph, and Weinberg 2021). Accordingly, we might expect the growth in WFH to affect where households of different incomes choose to reside relative to the city center.

3.1 Extending the Interpretive Framework

To think about the impact of WFH on spatial sorting, we extend the model above to allow for two groups of workers, unskilled and skilled, noted with subindexes 0 and 1. Earnings for the skilled are higher than for the unskilled, $w_1 > w_0$. Empirically, we identify the skilled in our model as the college-educated, so we use the terms skilled and college-educated interchangeably. We discuss how WFH may affect wages below, but for now we take them as exogenous. Commuting costs are also higher for the skilled, $\tau_1 > \tau_0$, to reflect that the value of their time is higher because of their higher wages.

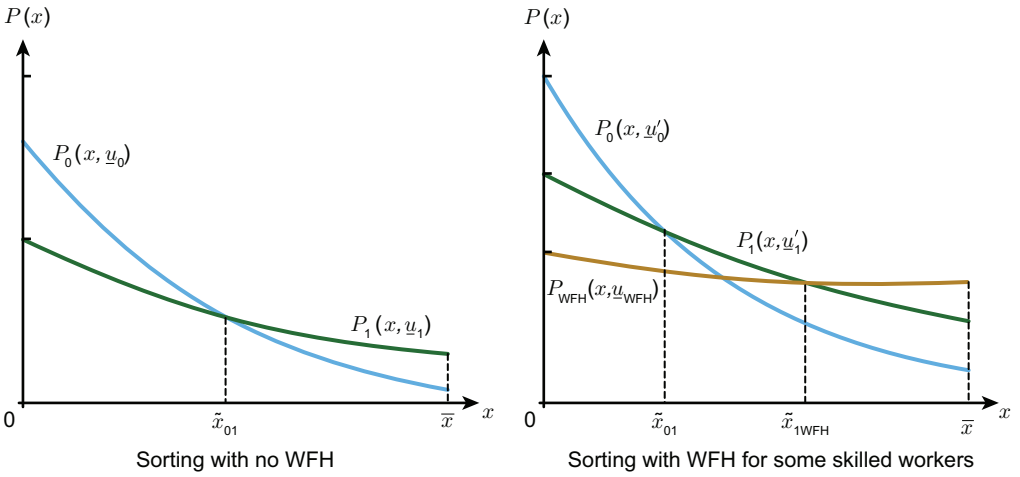
For residents of each group, we first solve for how much a utility-maximizing resident is willing to pay for housing at each location while reaching the group-specific utility achieved at the spatial equilibrium $\underline{u}_0$ or $\underline{u}_1$, which is unknown at this stage. The solution to this problem is a bid-rent function that reflects the price that each group is willing to pay for housing at each location x. For a given level of utility $\underline{u}_0$ or $\underline{u}_1$, this bid-rent function is denoted $P_0(x, \underline{u}_0)$ for the unskilled and $P_1(x, \underline{u}_1)$ for the skilled.

In equilibrium, each group resides in the set of locations where it outbids the other groups and the utility that residents of each group obtains must coincide with the utility $\underline{u}_0$ or $\underline{u}_1$ they expected when bidding for housing. Finding this equilibrium is relatively straightforward when bid-rent functions cross a single time. To understand why, note that there must be some region in which $P_1(x) \geq P_0(x)$ and some region in which $P_0(x) \geq P_1(x)$ for both types of residents to live in the same city. In turn, this implies that bid-rents must cross at some interior point $\tilde{x}$.

Where they cross, the relative slopes of the bid-rent functions determine on which side each group outbids the other and, therefore, resides in equilibrium. If $P_1'(\tilde{x}) = -\frac{\tau_1}{h_1(\tilde{x})} > -\frac{\tau_0}{h_0(\tilde{x})} = P_0'(\tilde{x})$, the skilled reside in the suburbs while the unskilled reside closer to the center with perfect sorting.[26] This equilibrium is formally solved for in Appendix 2 and depicted in the left panel of Exhibit 3. The last equation simplifies into $\frac{h_1(\tilde{x})}{h_0(\tilde{x})} > \frac{\tau_1}{\tau_0}$. This is a comparison of how much more housing the skilled consume relative to the unskilled with their relative commuting costs. More generally, richer residents live farther away from the center if the income elasticity of the demand for housing exceeds the income elasticity of the cost of commuting (Glaeser, Kahn, and Rappaport 2008).

Exhibit 3

Effects of Work-from-Home (WFH) Shocks on Spatial Sorting



Notes: The distance at which skilled workers become more likely to live in the suburbs adjusts up or down in relation to vertical shifts in the bid-rent function. See Appendix 2 for derivations and the main text for details about the quantification.

We can now consider what happens to this equilibrium sorting behavior after an increase in WFH. To gain insight, we exaggerate the current situation and assume that only skilled workers can work from home. As noted previously, they benefit from the commuting dividend but they also need to incur the home-office tax. From above, we know that this change will rotate the bid-rent function of remote skilled workers $P_1(x)$ to $P_{WFH}(x)$, lowering its slope. This adjustment is depicted in the shift in the right panel of Exhibit 3. Depending on how far the skilled bid-rent function shifts vertically because of the WFH housing tax, the distance at which the skilled become more likely to live in the suburbs $\tilde{x}$ will adjust either up or down.[27]

In a slightly more realistic scenario, only a subset of the skilled can work remotely. We model this scenario using three heterogeneous types: in-person skilled workers, remote skilled workers who mainly work from home, and in-person unskilled workers, as in Gokan et al. (2022). With three types, a share of the skilled stay at the same bid-rent function as prior to the WFH shift $P_1(x)$, while others move to the new bid-rent function, $P_1^{WFH}(x)$. The sorting in this scenario is depicted in the right panel of Exhibit 3. The unskilled continue to reside in a first ring close to downtown, while the in-person skilled reside in a second ring between $\tilde{x}$ and $\tilde{x}^{WFH}$ and the remote skilled reside in the outer suburbs, beyond $\tilde{x}^{WFH}$.

3.2 Quantifying the Model with Spatial Sorting

We quantify this extension by adding heterogeneous wages and commuting costs to the baseline specification above. Households still choose to allocate their post-commute income between housing and other goods, but we now have two groups earning different wages.[28] We fix the unskilled wage at $15 per hour, or $30,000 per year, and the skilled wage at $30 per hour, or $60,000 per year.[29]

We maintain that the per-hour commuting cost is the sum of the value of time and the cost of operating a vehicle. We assume that the value of time is still 0.6 of the hourly wage for each group. The cost of operating a vehicle is the same (still $15.05 per hour) for both groups, but because vehicle costs make up a different fraction of each group's wage, the wage gap drives the difference in commuting costs between the two groups. Where the model with homogeneous agents had a total cost of travel per hour of commuting equal to 1.3 times the hourly wage, in the heterogeneous agent case, this value diverges to 1.1 times the skilled wage and 1.6 times the unskilled wage.

We assume that the WFH shock affects half of the skilled and causes a 90 percent reduction in commuting for those who work from home.[30] With two skill groups, the predicted elasticity of housing prices with respect to distance from the center in the pre-COVID situation with no WFH is 0.116, similar to the 0.102 found previously in the homogeneous case, also pre-COVID. When we add the WFH shock just described, however, the overall elasticity does not change nearly as much as when we assumed that all workers worked from home a moderate amount. With WFH only for a subset of skilled workers, the elasticity drops from 0.116 to 0.113, while in the homogeneous case it falls from 0.102 to 0.068. This smaller decline in the price gradient is illustrated in the right panel of Exhibit 3.[31]

The residents who still commute every day are not unaffected by the WFH shock, however. Remote skilled workers spend part of their commuting dividend on housing, which increases aggregate housing expenditure. With a fixed supply of housing, a higher housing expenditure from residents of the outer ring ends up pushing housing prices up everywhere in the city. Despite a lower share of WFH relative to our baseline calculation, we note that the commuting dividend is still large since it applies to residents of the outer ring who live the farthest away from downtown and whose value of time is highest. Interestingly, the housing-price gradient does not rotate in the heterogeneous agent case as much as with homogeneous residents because the commuting costs of unskilled workers and in-person skilled workers are unchanged. Hence, the slopes of their bid-rent curves, which determine the housing-price gradient in the inner rings where they reside, remain the same.

The difference between the house-price gradient in the homogeneous and heterogeneous cases might help to explain the difference in the short-run and longer-run price dynamics documented above. Early in the pandemic, when most workers were remote, the homogeneous counterfactual where all workers enjoy the commuting dividend may be closer to reality. In the subsequent years, we expect to see remote work persist among the skilled and, even in this group, be bimodal, with some workers working remotely part or most of the time while others instead opting (or needing, in the case of high-skilled service jobs) to work in-person most of the time. These shifts align with housing rents first decreasing in the city center and then rising thereafter, while they monotonically rise in the suburbs over the whole period, where the reaction of housing prices was more subdued.[32]

To get a sense of the magnitude of the spillovers both across space and between groups in the heterogeneous model, we turn to the quantitative model's predictions of price growth at different distances from the city center and consider how these price adjustments affect the utility of the different types of workers. With homogeneous residents, prices decrease by 5.3 percent in the city center and increase by 4.2 percent at the periphery. These relative price adjustments maintain the spatial equilibrium where all households receive the same utility at all locations, and the relative growth of house prices in the suburbs offsets the

higher commuting dividend enjoyed by suburban residents. On net, all households see a slight gain in utility.

With heterogeneous residents, house prices increase by over 3.5 percent at all distances from the city center, with larger increases at the farthest distances from the city center, where the aggregate expenditure effect is compounded by the group-specific bid-rent increase for the remote skilled workers who live there. The share of income spent on commuting also changes for each of the groups. This happens for two reasons: first, half of the skilled workers reduce the number of times they commute, and second, spatial sorting causes the distances at which the groups reside to change. The aggregate amount spent on commuting therefore decreases by 0.05 percent for unskilled residents, who move slightly closer to the city center, and 46 percent for college-educated residents, who either live closer to the city center or work from home.

For in-person workers, the house-price increases outweigh the reductions in commuting costs. The utility of both skilled and unskilled workers who return to work in person declines by around 0.1 percent. The WFH dividend to the segment of college graduates that works from home results in a 14 percent increase in utility after accounting for changes in house prices and commuting costs. However, for people in this group, converting part of their homes into office space reduces utility. After accounting for both the commuting dividend and home-office tax, the result is a 5.5 percent increase in welfare inequality between the average skilled and unskilled workers.

Qualitatively, these predictions align with empirical evidence from Li and Su (2021) and are effectively the reverse of the pre-COVID trends studied in Su (2022), who identified the rising value of time among the high-skilled and the increasing attractiveness of a short commute as driving the sorting of these households downtown in recent decades (Baum-Snow and Hartley 2020; Couture and Handbury 2020). The increase in WFH stems from the relative benefit of the short commute offered by downtowns, so it is not surprising that this component of "urban revival" will reverse as a result.

4. Endogenous Amenities

The framework above assumed that location choice was a function of a simple trade-off between housing and commuting costs. Locations are not only characterized by proximity to workplaces and housing costs, but also by their amenities. Downtowns, in particular, offer far more density and variety of consumption amenities than the suburbs: businesses that provide nontradable services, such as restaurants, bars, and gyms, cluster in downtown areas attracted by the 24-hour foot traffic of workers during weekdays and residents on nights and weekends. Couture and Handbury (2020), for example, show that the density of restaurants was 20 percent higher at the center of the 100 largest cities in the United States than at their periphery. The relative density, variety, and quality of amenities in city centers also attract, and rely on, business from visitors (for example, tourists, business travelers, and suburban residents).

Policy restrictions closed service establishments across the United States during the early months of COVID. As cities emerged from the lockdowns of the early pandemic period

some, but not all, of this business returned and many establishments in city centers remained closed. Sedov (2021) showed that downtown restaurants were more likely to close over the course of 2021. De Fraja, Matheson, and Rockey (2021) document similar patterns in U.K. cities.

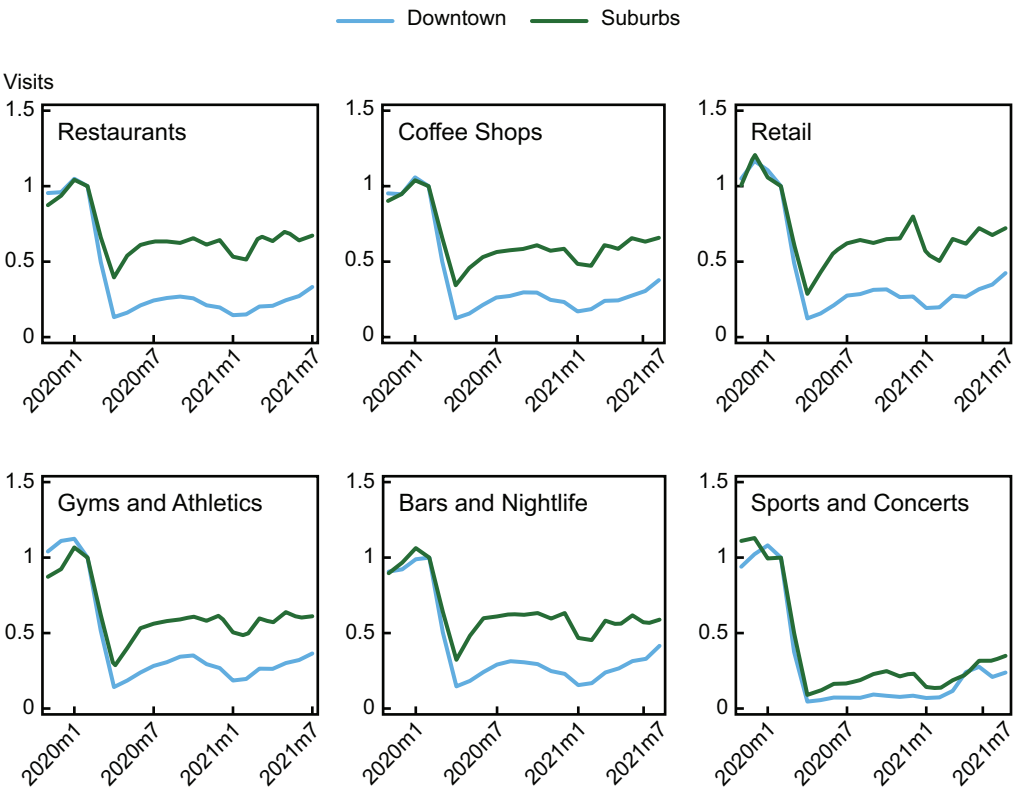
The extent to which amenities will return to city centers is an open question. In the short run, it depends on whether customers return. Some tourists and suburban residents visit downtowns for these amenities, so their return will depend on the reopening of the amenities themselves. Some of these customers visit downtowns for other reasons, such as work, visiting hotels for business conferences, or visiting historical or cultural venues.

So their return will rely less crucially on service establishments taking the first step of reopening. By summer 2022, business travelers and tourists mostly returned after conferences resumed and capacity restrictions at public historical and cultural venues were relaxed.[33] Still largely absent at this point, however, was foot traffic from office workers. Althoff et al. (2022) showed that consumer service spending and employment fell the most in U.S. cities with large pre-pandemic shares of business service workers, whose jobs can more easily be done remotely, and in spite of repeated predictions of the "return to the office," office foot traffic remained depressed below 50 percent of its pre-pandemic levels.

This shift in office foot traffic is mimicked in foot traffic to downtown restaurants and retail establishments. Chart 2 shows the foot traffic to dining, entertainment, and retail establishments by distance to the central business district. Foot traffic downtown dropped precipitously in March 2020 both downtown and in the suburbs. The drop was sharper downtown, however, and the subsequent rebound less robust. Through 2021, the restaurant and retail foot traffic downtown was at best 40 percent of its level in February 2020, but above 60 percent of its February 2020 level in the suburbs. Interestingly, the recovery of foot traffic at downtown entertainment venues was approaching that of entertainment venues in the suburbs, potentially reflecting a shift in downtown amenities from venues that sustain regular office workers and residents toward venues that cater to tourists and visitors from the suburbs for special events.

With the persistent de-densification of downtown offices and the return of travelers, the mix of customers visiting city centers has changed. The right panel of Chart 2 shows that downtown entertainment venues are seeing a stronger rebound in foot traffic than restaurants and retail, for example. In the medium run, the mix of establishments offered downtown will reflect this shift (see Duguid et al. [2023] for early systematic evidence). Businesses that serve regular office workers—take-out food stores, bars, and gyms, for example—will get replaced, to some extent, by businesses that cater to one-off visits by tourists and business travelers such as higher-end restaurants and entertainment venues. To the degree that the businesses that serve regular office workers also attract residents, particularly young professionals looking to spend time and money on services like bars and gyms, instead of on retail products and at home, the exit of these amenities will amplify the medium-run shift in these residential populations to the suburbs, as discussed more below. In the longer run, as office space is converted to hotel and residential space, we may also see the entry of businesses that cater specifically to the urban residential population (for example, supermarkets) attracting some residents back downtown, but this transition will be slow.[34]

Chart 2
Restaurant and Retail Foot Traffic in the Twelve Largest U.S. Cities



Source: Precisely PlaceIQ. Used by permission.

Notes: The illustrations present data for New York, Los Angeles, Chicago, San Francisco, Dallas, Houston, Miami, Philadelphia, Washington, D.C., Atlanta, Boston, San Francisco, and Phoenix by distance to the center. Downtown establishments are those within 2 kilometers of the center; suburban establishments are those farther out but within the same core-based statistical area (CBSA). The y-axes indicate total visits to the establishment category as measured by Precisely PlaceIQ reemergence data set.

4.1 Amenitization of the Suburbs?

Amenities do not only exist in city centers. The suburbs also offer nontradable services, albeit at lower densities, and the suburban shift in work-hour activity and residents will bring business to the suburbs. Chart 2 already shows a bias in the return of in-person activity toward suburban venues. The extent to which this increase in business will induce entry is an empirical question, but whatever entries of establishments occur in the suburbs is unlikely to entirely offset the number of exits from city centers. Duguid et al. (2023), for example, show that the number of establishments open in the suburbs had recovered their early COVID losses by the end of 2021, with a net gain of approximately 0.5 percent between the end of 2019 and the end of 2021, but establishment counts in the downtown core still lagged, with net losses of more than 3 percent over the same period. The features that make the suburbs more attractive for remote workers are

exactly those that make the suburbs less conducive for offering a rich density and variety of nontradable services. Suburban residents have access to more space for meal preparation at home than in the office, for example, so are likely to eat more of their daytime meals at home than the fast-casual options near work. Remote workers may substitute their daytime socializing for evening get-togethers but the extent to which this happens at home, at suburban establishments, or downtown will depend on the density and quality of options available to them in each location.

Dense suburban town centers that can leverage the increase in local demand with agglomeration benefits are likely to see the most gains from the remote work shift. These are also the most likely locations for entry of co-working spaces that some remote workers will seek out to take advantage of a shorter commute without having to create a home-office space.

On net, between the suburbs and downtown, the overall density of service establishments is likely to end up lower and, as a result, the average households will consume less of these services during their workdays, in particular. Net exit will induce people to eat more of their daytime meals and to socialize and work out more at home. Some substitution may happen to consumption on weekends or vacations, when consumption trips to city centers are more feasible. This substitution was seen in the summer of 2022, with the rebound of travel and tourism. To the extent that this trend persists, it points towards a shift in downtown amenities from the fast-casual chain restaurants and gyms that served workers, to restaurants, cafes, and more unique establishments that serve a group with more time on their hands and who are looking for a break from their day-to-day experience.

4.2 Urban Amenities in the Model

The response of local businesses to the suburbanization of work will amplify the predictions of the model presented above. To see this amplification, we can start by adding amenities to the model as in Brueckner, Thisse, and Zenou (1999). Utility is now obtained from consuming housing, h, other goods, z, and the amenities $a(x)$ afforded by the location of residence. The budget constraint is, as before, $w - \tau x = P(x)\, h + z$. The slope of the bid-rent function now has two terms to reflect that, and to maintain constant utility at all distances from the city center, housing prices must adjust to offset the differences in commuting costs and amenities across locations:

$$P'(x) = -\frac{\tau}{h(x)} + \frac{u_a}{u_z}\frac{a'(x)}{h(x)}$$

If households value amenities ($u_a > 0$) and amenities fall with distance from the city center (Couture and Handbury 2020), $a'(x) < 0$, the negative price gradient in the base case is explained by both commuting costs and the amenity gradient.

This simple setup assumes that amenities in each location x are exogenously determined and only consumed in the place of residence, so it abstracts from the forces that result in the suburbanization of amenities discussed above. To study the role that amenities will play in shaping how residential location choices and house prices respond to the increase in WFH, we consider how these factors respond to an exogenous shift in the amenity function, $a(x)$. We model the shift in the amenity function to reflect qualitative changes that we have observed in

the data since the COVID pandemic and expect to continue in the medium term. There are two elements to this shift. First, the amenity gradient ($a'(x)$) has become less steep: the suburban shift in workday foot traffic has led to closures of downtown establishments lessening the amenity advantage of city center. Second, while some of this foot traffic will lead to establishments opening in the suburbs, these openings are unlikely to increase the amenity value of the suburbs by enough to maintain the mean level of amenities across all locations. The suburbs, in particular, do not have the same population and employment density that make city centers such breeding grounds for amenities. As a result, the amenity curve $a(x)$ will be at a lower level than before the WFH shift.

To a first order, the dampening of the amenity gradient will affect the housing rent gradient in the same manner as the reduction in commuting costs. So the shift in amenities would amplify the outward shift in residential population to the suburbs and the twist in the house-price gradient depicted in left panel of Exhibit 2.[35] The downward shift in the amenity curve will decrease $\underline{u}$, offsetting the increase in average utility from the "commuting dividend." This drop in amenities would mitigate the increase in the citywide average of house prices from the dual WFH shocks depicted in the right panel of Exhibit 2. These two effects will unambiguously cause the price of housing downtown to decrease by more than it did when ignoring amenities. The effect on the price of housing in the suburbs will be ambiguous: accounting for the amenity shift to the suburbs will tend to cause prices to rise by more there (reflecting the increase in the amenity value of the suburbs) but by less overall (since the mean amenity value citywide drops).

4.3 Distributional Implications and Secular Trends

The loss of downtown amenities may have significant distributional consequences, since the way in which people engage with these businesses varies with socioeconomic status. College graduates are more frequent consumers of nontradable services, while the non-college-educated are more likely to work for firms that provide these services. Non-college-educated workers in these nontradable service businesses experienced severe job losses and see further losses or increased reverse commutes, as these amenities shift to the suburbs or close for good.

Offsetting these declines have been recent job growth associated with the strong rebound of tourism and the longer-run secular trends driving increasing demand for nontradable services among college graduates. Couture and Handbury (2020) linked an increasing demand for "urban" amenities (nontradable services that are offered distinctly downtown) to top income growth (reflecting increasing returns to education) and delayed childbearing. Neither of these trends show any sign of abating, so preferences for nontradable services will likely increase among the college-educated.

The extent to which this continuing shift in preferences for these activities will continue to drive high-income households downtown will depend on the extent to which these "urban" amenities continue to be an "urban" phenomenon. This potential development hinges largely on the intensity of the scale economies in city centers relative to the suburbs. If the scale economies in suburban town centers are strong, then the increasing tastes for nontradable services may interact with the WFH shift in the college-educated population to the suburbs to

result in the growth of "urban" clusters of amenities in these areas. We do have evidence of amenity locations shifting in response to changing commuting costs: Gorback (2020), for example, shows that the introduction of ride-sharing apps spurred entry of amenities away from public transit corridors and toward areas only accessible by car or foot. To the best of our knowledge, the elasticity of nontradable retail entry in response to demand growth has not been measured, so the degree of amenitization the suburbs will see in response to the WFH shocks remains an open empirical question, with the exception of the early signals reported above from Duguid et al. (2023).

5. Endogenous Productivity

In our model above, we make three important simplifying assumptions about productivity. First, there is no direct effect of WFH on wages, as if productivity when working from home was the same as in the workplace. Second, the choice of working from home is exogenous and, in the baseline model, is the same for everyone. Third, there is no indirect effect of WFH on wages. The choice made by others to work from home does not affect one's productivity at the workplace. Let us examine these issues in turn.

5.1 How Productive Is Work from Home?

Unfortunately, measuring the productivity differential between the workplace and home is difficult. Many of the skilled occupations that can be performed from home involve a variety of tasks and productivity for these tasks cannot be precisely measured, let alone compared between home and the workplace. For some insight, however, we can turn to pioneering research that measures the work-from-home productivity differential for call center workers, whose output is easily measurable and can also be performed remotely. In a field experiment, Bloom et al. (2015) found that Chinese call center worker output increases by about 13 percent when moving from the workplace to working from home. Most of this increase is because workers increase their hours, but one-third is attributable to an approximate 4 percent increase in productivity. Emanuel and Harrington (2023) find an even larger 7.5 percent productivity increase for U.S. call center workers who elected to work from home when given the option in a 2018 field experiment. Notably, the remaining workers who had not elected to work from home saw a similar increase in productivity when they had to work from home early in the COVID pandemic. The output gains in the Bloom et al. (2015) setting were in fact amplified to 22 percent when all workers became eligible to select to either work in the workplace or from home. Beyond output, Bloom et al. (2015) also found that workers reported greater work satisfaction when working from home.

More recent work suggests that WFH might help stem attrition but not enhance the productivity of the skilled workforce that is more likely to work from home post-pandemic. Bloom, Han, and Liang (2022) randomizes Chinese workers, including engineers and finance and marketing employees, into a hybrid work setup where they WFH two days a week. The

treated hybrid workers were 35 percent less likely to leave the firm and reported higher work satisfaction but, overall, WFH had no impact on performance reviews or promotions. The news was more positive for IT engineers, whose productivity could be measured with the number of lines of code written: the productivity of treated IT engineers rose by 8 percent relative to similar employees in the control group.

Barrero, Bloom, and Davis (2021b), Etheridge, Wang, and Tang (2020), Bartik et al. (2020), and Morikawa (2020, 2021) also provide similarly varied estimates of the impact of remote work on productivity.[36] Part of this variation might be due to WFH and in-person work being imperfect substitutes, which Behrens, Kichko, and Thisse (2021) show implies a bell-shaped relationship between WFH and productivity. There is also considerable heterogeneity with large declines in productivity in occupations less suitable for WFH.[37] Further, many of these studies are conducted in the context of serious lockdowns that may lower productivity independent of work location. Many firms also reduced their activity during lockdowns so it is difficult to distinguish between the effects of a lower demand and actual productivity (output per unit of time). Relevant for our purpose here, results from less drastic WFH experiments with optional hybrid work arrangements are much more encouraging and suggest modest overall productivity improvements and sizeable increases in well-being.

5.2 How Many Workers Will Work from Home?

There is tremendous heterogeneity among occupations in their suitability for WFH; call center workers are perhaps at one extreme and hairdressers at the other. Among skilled workers, there is also tremendous heterogeneity among tasks within occupation. Some tasks require face-to-face interactions while others may be conducted more productively at home.[38] There are also large differences in workers' individual desire and ability to work from home (Bloom et al. 2015; Emanuel and Harrington 2023). Personality traits and family situations are likely to loom large here.

With massive differences in the possibility to work from home on the supply side and equally large differences in workers' desire for such an arrangement on the demand side, WFH must be a preferable option, at least some of the time for some workers. Some workers will need to commute to work every day, others will work from home part of the time, and some may perhaps work from home all the time. More generally, we expect the demand for WFH by workers to be governed by how amenable to WFH their job is and their relative like or dislike of WFH weighted against (commuting) gains and (home-office) losses when working from home.

Davis, Ghent, and Gregory (2021) model the choice between WFH and work at the office jointly with the choice of residential location. Like for Behrens, Kichko and Thisse (2021), key to the model is the elasticity of substitution between WFH and work from the office. They estimate this parameter using the pre-COVID relationship between commuting times and the propensity to work from home. Their preferred estimate for the elasticity of substitution between WFH and work from the office is about 5.[39] Assuming this elasticity, it takes a near 50 percent increase in the productivity of WFH to explain the trebling in the propensity to WFH (from about 10 percent of the time to 30 percent) observed between 2019 and 2021.[40]

Stepping back from the specifics of the model, both a large increase in the efficiency of WFH and a fairly high elasticity of substitution between WFH and work from the office are needed to explain such a large shift towards WFH from "almost never" before COVID to "some of the time" two years later.[41] Looking forward, the same high elasticity of substitution implies that the WFH productivity gain to reach "a lot" of WFH (say, four days a week) may not be that high.[42] But, by the same token, a more productive workplace could easily swing the WFH pendulum back to, say, only one day a week on average. We are in a region where the share of WFH can move easily.[43] Pushing the argument further, reaching a state of WFH "most of the time" is a much more distant prospect as it would require massive further improvements in the WFH technology.

This said, workers may not care so much about their productivity as they care for their wage and career prospects. Productivity, wages, and career progression do not map one-for-one into each other. In particular, there is a well-known stigma associated with WFH.
Bloom et al. (2015) and Emanuel and Harrington (2023) document that workers working from home are, all else equal, less likely to be promoted.[44] The key question here is, of course, whether this stigma will fade as firms get better in their assessment of remote work and workers.[45] If not, it is easy to imagine situation where future selection into WFH, likely driven by non-labor-market considerations, could worsen outcomes for certain groups of workers.[46]

5.3 Agglomeration Effects

Although we cannot say for certain how much work will be done remotely in the long run, many workers appear to have decided they want to work remotely, at least some of the time, (Barrero, Bloom, and Davis 2021a) and firms will bow to these demands, to some extent. This shift has already left many downtown firms with vast amounts of surplus office space. As argued above, key to the revival of downtown retail is the return of daytime workers. A second concern is how productive city centers will be with half (or fewer) as many workers on-site. daily. That is, will the productivity advantage of cities remain when fewer workers are concentrated there to generate agglomeration effects?[47]

Following Marshall (1890), we traditionally distinguish between agglomeration effects happening through input-output linkages, thick local labor markets, and direct interactions (spillovers). For input-output linkages, the relevant spatial scale is the metropolitan area and perhaps the region around it. Even in a world of just-in-time production, there is no real need for trading firms to cluster closely because an extra hour's drive for a delivery may not be crucial. Hence, when agglomeration effects find their source in metropolitan or regional trade between firms, WFH is unlikely to play a major role, provided remote workers remain in the same region.

For direct interactions and knowledge spillovers, distances are arguably much shorter. As stated by Glaeser et al. (1992): "After all, intellectual breakthroughs must cross hallways and streets more easily than oceans and continents." If agglomeration effects are all about knowledge spillovers, a lower downtown density could really reduce a downtown's productive advantage, relative to both other downtowns and other locations in the same city.

Unfortunately, the literature has not successfully disentangled the channels of agglomeration, an extremely challenging exercise.[48] Studies that organize a horse race between channels often conclude with a fairly even split (see, for example, Ellison, Glaeser, and Kerr [2010]). If these

results hold true, the rise of WFH could amount to a wash in terms of urban productivity. Falling downtown employment because of WFH implies fewer direct spillovers, but, with the reduced need for commutes, these cities will also be able to benefit from a thicker labor market as they expand their reach.

While the productivity effects of WFH via agglomeration might wash out given the various agglomeration externalities operating at different spatial scales, their impact might vary within and across cities given the variation in the extent of WFH across these locations. Rosenthal and Strange (2020), for example, report that there is strong spatial decay in local agglomeration effects, with spillovers fully disappearing within 10 minutes of travel time. If true, this finding is both bad news and good news. Downtowns may end up suffering greatly because of WFH but the damage will be contained within a short radius.[49] Then, the metropolitan area outside of this center may be mostly unaffected.[50]

Even if we take agglomeration effects at face value and assume that they are a direct function of local employment density as estimated by much of the literature, we note that the same literature has consistently found relatively modest agglomeration effects. This near-consensus retains an agglomeration elasticity between 0.02 and 0.08. That is, a 10-percent increase in the scale of a city translates into 0.2 to 0.8 percent higher wages. Naively applying the upper bound of this estimate to the WFH shock implies that the reduction in worker density downtown of 40 percent would yield a drop in wages of 4 percent. Although not trivial, this maximum effect corresponds to about two years of income growth.[51] This benign effect would offset some of the increase in demand for cities coming from the WFH commuting dividend and the home-office tax.[52]

6. Long Run

Using the framework we have developed and the evolution we described in Section 2, we can now extrapolate and consider a longer time horizon where the stock of both housing and commercial real estate adjust. The considerations that follow are obviously highly speculative and should thus be taken with caution.

6.1 The Consumer City for the Creative Class?

In the longer run, as office space is converted to alternative uses, downtowns could become more consumer-centric destinations. As the growth in WFH reduces the density of workers downtown, commercial office rents are likely to drop in real terms inducing some re-sorting of commercial tenants in the medium run and redevelopments and adjustments in land use in the long run. Firms whose activities can only be done (or are done best) in person, such as entertainment, medical services and research, and education, but were previously outbid for downtown space, might move or expand closer to city centers as rents decline.

Though possible, this transition is likely to be slow. For the "creative class" of tenants to move into downtown office space, the prevailing rent level first needs to drop. The multiples at which the stocks of public companies that own office buildings were being traded dropped in 2020,

indicating that the market expects rent declines, or at least elevated rent uncertainty, but these shifts might take time to be realized as since commercial rents are notoriously sticky. For one, many tenants will be paying rents contracted pre-COVID on 10-year leases that will run through at least 2025. Considerable uncertainty also remains regarding when WFH will shift to purely optional and not be driven by health concerns as it was as recently as January 2022. So, tenants with leases maturing might be considering short-term extensions based on existing lease terms and delaying making long-run real estate decisions until more uncertainty is resolved. Finally, landlords uncertain of the impact of WFH on market rents will sustain high vacancies in the medium term while they test the elasticity of demand for their product.

Further, accommodating new tenants can require significant refurbishments and, sometimes, redevelopments of the commercial space. These redevelopments cannot begin until these properties are being sold at a basis low enough for buyers to make these expensive investments profitably. Prices will be sticky in the asset market as well, and with sizeable amounts of capital-seeking yield, the type of distress—forced and foreclosure sales—that often pushes property prices down has not yet been widely observed since the pandemic. Once prices do drop, however, there will be scope for redevelopment, though it too will take time given zoning and construction lags.[53]

6.2 Sprawl and Cross-City Migration

Other longer-run adjustments will occur in the residential market. One possibility of the redevelopment of downtowns might be an increase in multifamily apartment housing. In other cities, the more likely scenario is an outward expansion with new development of housing in far-reaching suburbs.

We can use the model from Section 2 to gauge the potential scope of this sprawl. Consider the following thought experiment. Assume that pre-COVID, the cost of housing at the urban fringe is equal to its replacement cost and any extra amount needed to convert land into a residential use. Put differently, we now assume that the baseline city we consider was, pre-COVID, at its long-term equilibrium where we allow for workers to move across cities and construction to expand the urban fringe. With WFH, it is easy to show that the urban fringe needs to expand considerably to reach again the same price as at the pre-COVID fringe. With our values and a 30 percent rate of WFH, the urban fringe, initially 60 kilometers from the center, nearly doubles to about 114 kilometers (ignoring any increase in population).[54] Put slightly differently, the increase in housing prices at the urban fringe will put considerable pressure for cities to expand.

Glaeser (2022) provides early evidence of a boom in new permits in 2021 relative to 2019. While this boom may be short-lived in a period of higher interest rates and much lower growth, it reflects some underlying long-term trends and a high unmet demand for housing. Crucially, this boom in new permits is spatially uneven. Among the largest metropolitan areas in the country, San Francisco, San Jose, Portland, and New York all experienced a decline in new permits despite house prices going up by 12 to 20 percent between 2019 and 2021. Sunbelt metropolitan areas have been much more willing to accommodate this increased demand for housing. The likes of Austin, Phoenix, Raleigh, Nashville, Memphis, and San Antonio all experienced a growth in new permits of 30 percent or more. Linking back to our model above,

only some cities will experience the type of expansion we just described while others will remain stuck within their fixed boundaries without allowing for much more densification either. With a near-fixed stock of housing and a higher demand for residential space by households working from home, more restrictive cities are likely to experience a continuous slow decline in population. Many of their residents will migrate to Sunbelt cities. This is of course not a new phenomenon. The novelty is that these growing cities will likely accommodate these new residents at their urban fringe made appealing by reduced commuting requirements.

7. Conclusions

For cities in the United States, the first two years of the pandemic led to an initial plunge in downtown residential property prices followed by a rebound while suburban residential prices kept increasing. We relate this evolution to a sharp rise in working from home, a trend that shows no sign of abating. Our analysis interprets these changes using a simple urban monocentric model. We first consider a pandemic period with WFH for all workers. We then model a post-pandemic situation where WFH is disproportionately performed by a subset of more skilled workers. A calibrated version of our model is able to replicate the magnitude of the observed changes in housing prices as WFH increases housing demand owing to a commuting dividend and a home-office tax. Overall, our modeling suggests small net gains associated with WFH. However, the distributional implications of WFH are stark with significant gains for remote workers and losses for in-person workers caused by higher housing prices.

To gain insight on the broader effects of COVID on cities, we further highlight the importance of urban amenities which follow workers and reinforce the downtowns' losses relative to their suburbs. Reviving a daytime economy is a major challenge for downtown if cities want to keep a vibrant nighttime economy. We also consider the effects of these changes on the agglomeration benefits of cities and conclude that they are unlikely to affect our conclusions in a major way.

Finally, we provide some speculation as we consider a longer-run situation with adjustments to the stock of housing, perhaps only in some cities. Rising work from home will likely result in considerable pressure for urban expansion. Some downtowns may also enjoy a strong revival as they attract more creative workers who still want to work in person.

Appendix 1: The Monocentric Model with Cobb-Douglas Preferences

Assume that utility is Cobb-Douglas in housing and other goods: $u(h, z) = h^{\alpha} z^{1-\alpha}$. Relative to the assumptions made in the main text, we also assume that the cost of commuting is no longer linear in distance and follows instead τx^{γ} with $\gamma < 1$. This reflects the fact that in the data, the vehicles miles traveled by residents are less than proportional to the distance between their residence and the city center. Finally, we also assume that one unit of housing is supplied at every location between the center 0 and the urban fringe $\bar{x}$.

To solve this model, we follow the Marshallian approach, as used by Duranton and Puga (2015). For a resident in x, maximizing $u(h,z) = h^{\alpha} z^{1-\alpha}$ with respect to h and z subject to $w - \tau x^{\gamma} = P(x)\, h + z$ implies:

$$P(x) = \frac{\frac{\partial u(h,z)}{\partial h}}{\frac{\partial u(h,z)}{\partial z}} = \frac{\alpha z}{(1-\alpha)h} = \frac{\alpha\left(w - \tau x^{\gamma}\right)}{h}, \tag{a1}$$

where the first equality results from equating marginal utility per unit of income across housing and other goods, the second one is obtained using the functional form we chose for utility, and the third one follows from the substitution of z using the budget constraint.

In equilibrium, free mobility among similar residents implies a common, but yet to be determined, level of utility $\underline{u}$:

$$u(h(x), z(x)) = \underline{u}\,. \tag{a2}$$

To find the optimal location of a resident, we can substitute $z(x)$ into equation (a2) using the budget constraint $z(x) = w - \tau\, x^{\gamma} - P\,(x)\, h(x)$ before totally differentiating equation (a2) with respect to x to obtain:

$$\frac{\partial u(h,z)}{\partial h}\frac{\partial h(x)}{\partial x} - \frac{\partial u(h,z)}{\partial z}P(x)\frac{\partial h(x)}{\partial z} - \frac{\partial u(h,z)}{\partial z}\left(\tau\gamma x^{\gamma-1} + h(x)\frac{\mathrm{d}P(x)}{\mathrm{d}x}\right) = 0. \tag{a3}$$

From the first order condition (a1), the first two terms in equation (a3) cancel out, which implies

$$\frac{\mathrm{d}P(x)}{\mathrm{d}x} = -\frac{\tau\gamma x^{\gamma-1}}{h(x)}. \tag{a4}$$

This last expression is analogous to equation (2) in the main text for the more complicated case of nonlinear commuting costs.

Appendix 1 (Continued)

Substituting $h(x)$ from this last equation using equation (a1) yields the following ordinary differential equation:

$$\frac{\frac{dP(x)}{dx}}{P(x)} = -\frac{-\tau\gamma}{\alpha x^{1-\gamma}\left(w-\tau x^{\gamma}\right)}. \tag{a5}$$

It can be verified that the solution of this ordinary differential equation is of the form:

$$P(x) = C_1\left(w-\tau x^{\gamma}\right)^{\frac{1}{\alpha}}, \tag{a6}$$

where C_1 is a constant to be solved for. Fitting equation (a1) into this last expression, we can write housing demand as

$$h(x) = \frac{\alpha}{C_1}\left(w-\tau x^{\gamma}\right)^{1-\frac{1}{\alpha}}. \tag{a7}$$

To solve for $C_{1,}$ we use the population constraint which states that the supply of housing in the city must equal demand:

$$\int_0^{\bar{x}} \frac{s(x)}{h(x)}dx = \int_0^{\bar{x}} n(x)dx = N, \tag{a8}$$

where $s(x)$ is the supply of land at location x, which divided by the individual consumption of land, $h(x)$ is also the density of population at the same location. Then, integrating population density over the whole extent of the city from 0 to the urban fringe $\bar{x}$ yields city population, N.

Assuming $s(x) = x^{\sigma}$ and substituting $h(x)$ using equation (a7), equation (a8) can be rewritten as

$$N = \int_0^{\bar{x}} \frac{C_1}{\alpha} x^{\sigma}\left(w-\tau x^{\gamma}\right)^{\frac{1}{\alpha}-1}dx. \tag{a9}$$

When $\alpha = 1/3$, as we assume, this expression easily integrates and we can solve for C_1:

$$C_1 = \frac{N}{3\bar{x}^{\sigma+1}\left[\frac{\tau^2\bar{x}^{2\gamma}}{\sigma+2\gamma+1} - \frac{2\tau w\bar{x}^{\gamma}}{\sigma+\gamma+1} + \frac{w^2}{\sigma+1}\right]}. \tag{a10}$$

Appendix 1 (Continued)

Importantly, we also note that at the spatial equilibrium

$$\overline{u}=u\left(0\right)=\alpha^{\alpha}\left(1-\alpha\right)^{1-\alpha}\frac{w}{P\left(0\right)^{\alpha}}=\alpha^{\alpha}\left(1-\alpha\right)^{1-\alpha}C_{1}^{-\alpha}, \tag{a11}$$

where the second equality arises directly from the first-order conditions for profit maximization and the last one uses expression (a6) valued at $x = 0$. Keeping in mind that the disposable wage $w - \tau \bar{x}^{\gamma}$ is positive, it is easy to show that $d\bar{u}/d\tau < 0$ and $d\bar{u}/dN < 0$.

Appendix 2: An Extension with Heterogeneous Residents

In an extension of the model, utility is still Cobb-Douglas in housing and other goods: $u(h,z) = h^{\alpha}z^{1-\alpha}$. We consider three groups of workers: unskilled, skilled, and skilled who work from home. The earnings of "in-person" and "remote" skilled workers are equal and higher than earnings of the unskilled: $w_1 = w_{\text{WFH}} > w_0$. Commuting costs also differ across groups with $\tau_1 > \tau_{\text{WFH}}$ and $\tau_1 > \tau_0$. We further restrict commuting costs to be such that the unskilled reside closer to downtown in equilibrium.

For residents of each group k in {0, 1, WFH}, the bid-rent functions

$$P_k(x) = C_k\left(w_k - \tau_k x^{\gamma}\right)^{\frac{1}{\alpha}} \tag{b1}$$

match equation (a6), and the housing demand functions

$$h_k(x) = \frac{\alpha}{C_k}\left(w_k - \tau_k x^{\gamma}\right)^{1-\frac{1}{\alpha}} \tag{b2}$$

match equation (a7) as the consumer problem for residents of each group is solved in the same manner as above.

There are five remaining unknowns: the three bid-rent intercepts C_0, C_1, and C_{WFH}, as well as the boundaries $\tilde{x}_{01}$ between unskilled and in-person skilled and $\tilde{x}_{1\text{WFH}}$ between in person and remote skilled. First, it must be the case that the bid-rent curves are equal between two groups at the boundaries where they intersect:

$$P_0(\tilde{x}_{01}) = P_1(\tilde{x}_{01}) \tag{b3}$$

$$P_1(\tilde{x}_{1\text{WFH}}) = P_{\text{WFH}}(\tilde{x}_{1\text{WFH}}) \tag{b4}$$

Second, the group-specific market clearing conditions resembling equation (a8) imply the following three equations

$$\int_0^{\tilde{x}_{01}} \frac{s(x)}{h_0(x)}\,dx = N_0, \tag{b5}$$

$$\int_{\tilde{x}01}^{\tilde{x}_{1\text{WFH}}} \frac{s(x)}{h_1(x)}\,dx = N_1, \tag{b6}$$

$$\int_{\tilde{x}_{1\text{WFH}}}^{\bar{x}} \frac{s(x)}{h_{\text{WFH}}(x)}\,dx = N_{\text{WFH}}, \tag{b7}$$

where N_k denotes the population of group k, $s(x)$ denotes the supply of land at location x, and $\bar{x}$ is the distance to the urban fringe. After finding an analytical form of the integral analogous to equation (a10), we solve the system of nonlinear equations (b3) through (b7) numerically.

Appendix 2 (Continued)

Finally, we are able to calculate equilibrium welfare for each group using the computed values of C_k, as in equation (a11):

$$\overline{u}_k = \alpha^{\alpha} \left(1-\alpha\right)^{1-\alpha} C_k^{-\alpha}. \tag{b8}$$

Appendix 3: Data Sources and Treatments

To discipline our quantification, we use data similar to those of Duranton and Puga (2022) and treat them in the same way, unless our model requires a different approach to accommodate variable housing consumption, which is constrained exogenously in Duranton and Puga (2022). The appendix of Duranton and Puga (2022) provides further details not reported here.

Cities

To define cities, we use Metropolitan Statistical Area and Consolidated Metropolitan Statistical Area (MSA) definitions outside of New England and New England County Metropolitan Area (NECMA) definitions, as set by the Office of Management and Budget on June 30, 1999. This defines 275 metropolitan areas in the conterminous United States. We define the city center as the location indicated by Google Maps for the core city of the metropolitan area. We measure the distance to the center as the haversine distance between the centroid of each block-group and the center of each metropolitan area. For city population, we use county-level population from the U.S. Bureau of the Census (2012) for 2010.

National Household Travel Survey

Data on household travel behavior come from the 2008–09 U.S. National Household Travel Survey (NHTS) produced by the U.S. Department of Transportation. We measure commuting trips from trip-level data using information about trip purpose.

The elasticity of commuting distance with respect to distance to the center

For consistency with Duranton and Puga (2022), we estimate the elasticity of commute trip length with respect to distance to the center by duplicating their estimation of a similar elasticity for total vehicle distance traveled. That is, we use the natural log of trip length for commuting trips as a dependent variable instead of an estimate of annual vehicle kilometers traveled. Then, we use the same controls for household and block-group characteristics, and metropolitan area fixed effects. The controls are socioeconomic characteristics of drivers and their households as well as socioeconomic and geographic characteristics of their block-group of residence. For comparability with Duranton and Puga (2022), we use the same approach to data cleaning and excluding observations.

American Community Survey

All our estimations regarding population and the number of housing units are at the block-group level using 5-year (2008–12) data from the 2012 American Community Survey (ACS), obtained from the IPUMS-NHGIS project (Manson et al. 2021).

The elasticity of housing supply with respect to distance to the center

We use data from the American Community Survey for 2008-12 at the block-group level as in Duranton and Puga (2022). We first multiply the number of housing units in each block-group by the average number of rooms to obtain the total number of rooms in each block-group. Because we are interested in measuring total housing supply for each distance, we must account for the fact

Appendix 3 (Continued)

that block-groups tend to be slightly larger and more numerous as distance to the center increases. These characteristics are obviously because cities expand over two dimensions.

To obtain total housing supply, we thus multiply the number of rooms in each block-group by a weight factor. This weight factor is computed using a nonparameteric estimate (kdensity) of the density of block-groups by log distance to the center for each of 275 U.S. MSAs.

We finally regress the natural log of housing supply on log distance to the center and MSA fixed effects. We only consider block-groups more than 5 kilometers away from the center as to avoid non-residential areas. We also consider only block-groups closer than the 90th percentile of block-group distance in its MSA. This selection avoids scarce block-groups close to the urban fringe of metropolitan areas which is often highly jagged. Finally, we weight block-groups in the regression by their inverse density weight to avoid double counting.

For 114,876 block-groups in 275 MSAs, we estimate an elasticity of 0.490 with an *R*-squared of 0.34. We retain a rounded-up value of 0.5 for our quantification. For 87,026 block-groups in the fifty largest MSAs, we estimate an elasticity of 0.561 with an *R*-squared of 0.38. We acknowledge that this regression may slightly underestimate the true elasticity of housing supply with respect to distance since we do not account for the fact that room size is likely to vary with distance to the center.

Notes

Acknowledgments: This paper was first presented at "The Future of New York City: Charting an Equitable Recovery for All" conference on March 31, 2022. The authors thank the conference organizers, their co-panelists, and other participants for valuable feedback, and Ryan Hastings for outstanding research assistance. Both authors are grateful to the Zell/Lurie Real Estate Center for financial support.

[1] A related literature has studied the role of cities in the spread of infections (for example, Glaeser, Gorback, and Redding [2022]; Almagro and Orane-Hutchinson [2022], Almagro et al. [2022]; and Glaeser and Cutler [2021]). We set aside issues of the role of cities in driving infections for two reasons. First, we take a longer view. Second, the literature so far has concluded that while cities get infected first, they do not get hit harder than nonurban regions (Carozzi, Provenzano, and Roth [2020]).

[2] See Van Nieuwerburgh (2023) for another review.

[3] The differences between rents and prices are difficult to interpret. The lesser price appreciation in the suburbs could reflect expectations of a tapering of rents or a change in risk perception. We also keep in mind that Mondragon and Wieland (2022) find statistically indistinguishable effects on rents and prices.

[4] Rent adjustments can be extremely slow following a crisis. Because leases are signed for many years in the office sector, building owners often prefer to wait for rents to recover rather than be stuck with a tenant paying a much lower rent for many years. Interestingly, Gupta, Mittal, and Van Nieuwerburgh (2022) also document large differences between class A offices and the rest of the market, suggesting the emergence of a marked "flight to quality" effect.

[5] See https://www.kastle.com/safety-wellness/getting-america-back-to-work/.

[6] Of course, not all jobs are literally located downtown. We take this into account in our quantification. We also discuss the difference between (often) highly skilled office jobs and the provision of local services, which are located where people work and live. However, for now, we abstract from these complications to focus on the key trade-offs.

[7] Obviously, there is a lot of heterogeneity among residents in any city. As in our analysis, the literature deals with this heterogeneity by assuming that it can be modeled though the existence of different groups, based on income or race. These groups differ by income or taste but group members are identical.

[8] Barrero, Bloom, and Davis (2021a), for example, report survey evidence that employers expect that approximately half of their employees will be able to work from home post-pandemic, but for only two days a week. The requirement that employees work on site three or more days a week will keep most in the same commuting zone in which they work.

[9] We consider for simplicity that households can choose exactly how much housing to consume. In reality, this choice is constrained by the discreteness of housing units. Hence, it is not only the aggregate quantity of housing but also the nature of that housing that is fixed in the near term. When housing is discrete and differentiated, the equilibrium must be solved as an assignment problem (Wang 2022). This assignment is subject to frictions such as the cost of brokerage and imperfect information. These assignment frictions were possibly exacerbated during the COVID-19 crisis, resulting in fewer quantity adjustments and stronger price effects than we have here.

[10] Formally, this condition appears after fully deriving the spatial equilibrium condition $u(h(x), w - \tau x - P(x)h(x)) = \underline{u}$ with respect to x. Small changes in the consumption of housing, $\mathrm{d}h(x)$, do not appear in this expression because they cancel out with small changes in the consumption of other goods after making use of condition (1). See Appendix 1 or Duranton and Puga (2015) for a full proof.

[11] As noted above, this consumption problem differs from the standard consumer problem, which takes prices as given and thus keeps the slope of the budget constraint fixed. We instead keep the intercept fixed and rotate the budget constraint to reach the tangency point between the budget constraint and the indifference curve. In turn, the slope of the budget line in equilibrium gives us the price of housing at this location. In the full model, we then solve for the common utility by equating the demand and supply of housing at every location. See Appendix 1 for an example with a specific utility function.

Notes (Continued)

[12] To keep matters simple, we consider that the change in the number of commuting days is exogenous. It would be easy to endogenize this fact and consider working from home a choice made easier after COVID. See Bond-Smith and McCann (2022). The main additional result we would expect in this setting is a greater propensity to work from home for residents located farther from downtown. We discuss residential sorting in Section 3 on "COVID and Spatial Sorting."

[13] In Section 3, we discuss the opening of two important margins: building new housing and moving across cities.

[14] There are further differences among owners. Owners who are earlier in their life cycles seek to increase their housing consumption, while older owners seek to reduce housing consumption after the departure of their children. All else equal, the increase in house prices therefore hurts the first group but benefits the second.

[15] The effect of the WFH tax on the slope of the bid-rent curve is ambiguous and depends in complex ways on how the price elasticity of the demand for housing varies with the price level. It also depends on the income elasticity of the demand for housing.

[16] We discuss recent work that centers on the sorting implications of WFH in Section 3.

[17] See also Rappaport (2014, 2016) and Duranton and Puga (2022) for related quantifications of the monocentric model.

[18] While this Cobb-Douglas specification is commonly used in the literature, preferences for housing vs. other goods would perhaps be more appropriately modeled using an elasticity of substitution of less than 1 since residents of cities where housing is more expensive spend a higher share of their income on this item. The share of housing in expenditure also declines with income, a fact that would call for further modeling complications such as a minimum level of housing consumption. See Combes, Duranton, and Gobillon (2019) for evidence and discussion. We note a small increase in the share of housing in U.S. household expenditure to 34.9 percent in 2020 from 32.8 percent in 2019.

[19] Following Duranton and Puga (2022), for each metropolitan area, we measure the urban fringe using the 95th percentile of distance to the center for the entire population of this metropolitan area, which we locate at the block-group level. The average distance to the fringe for the three cities just below Tampa in the population ranking and the three just above is 66 kilometers, slightly above Tampa's 58 kilometers.

[20] The average distance to work for commuters who live within 3 kilometers of their city center is 10.02 kilometers in the 2008 NHTS. For commuters who live between 3 and 7 kilometers from their city center, average distance to work is 11.85 kilometers. For commuters residing at the "urban fringe" (between 50 and 70 kilometers from the center), their one-way commuting distance is about 23 kilometers. For the much smaller sample of only Tampa drivers, distance to work for commuters at the urban fringe is slightly lower at 21 kilometers.

[21] Note that our functional forms imply that the price gradient is not exactly a power function of the distance to the center, x. The R^2 of the regression is 0.99, however, so our log-log form is a reasonable approximation. More generally, we know from Appendix 1 that housing prices in the model with our assumptions are proportional to $(w - \tau x^{\gamma})^{1/\alpha}$. Since commuting costs are modest relative to the wage, when taking logs, the slope of $\log P(x)$ when measured against $\log(x)$ is roughly proportional to τ and thus to the cost of commuting time. By the same token and to preview an important result discussed later in this analysis, we note that this gradient elasticity is also close to proportional to the share of workdays at the workplace, that is, 1 minus the share of WFH.

[22] Our predicted elasticity is also larger in magnitude than the possibly underestimated elasticity of about -0.03 estimated by Gupta et al. (2022) for rents in the thirty largest U.S. metropolitan areas. The difference with the results of Duranton and Puga (2022) is likely due to the fact that Gupta et al. (2022) do not control as extensively for local and house characteristics, which on average improve with distance to the center for U.S. cities. Gupta et al. (2022) also estimate an elasticity of about -0.10 for house prices in the largest metropolitan areas.

[23] We keep in mind that Gupta et al. (2022) estimate a smaller decline for the elasticity of house prices.

Notes (Continued)

[24] When decomposing the differences between remote and nonremote households, Stanton and Tiwari (2021) first find that remote households own fewer cars but this difference, which translates into a lower transportation expenditure, only partly offsets higher housing expenditure. They also find that remote households tended to live on average in neighborhoods with more expensive housing. Most importantly, remote households consumed 0.3 to 0.4 more rooms per dwelling. This corresponds to a 5 to 7 percent increase in the number of rooms relative to nonremote households. Remote households also spent more per room, perhaps because these rooms were larger. Overall, remote households were thus consuming more space and were possibly consuming higher quality space.

[25] Stanton and Tiwari (2021) compute that households in the bottom decile require an earnings premium of between a 10 and 15 percent to offset additional housing expenses associated with remoted work, while households in the top decile require no discernible additional compensation. An alternative is, of course, to think of the home-office tax as a lump sum, which would be an exaggeration in the opposite direction.

[26] In reality, sorting is not perfect. This model provides the intuition only for the general conditions under which the skilled will have a tendency to reside downtown or in the suburbs. In reality, residents will also have idiosyncratic preferences for locations, and the supply of housing is discrete and heterogeneous. See Duranton and Puga (2015) for further discussion.

[27] If skilled workers gain from WFH, part of that gain must imply an increase in their bid-rent and thus a reduction in $\tilde{x}$, the boundary between the region occupied by the unskilled closer to downtown and the region occupied by the skilled farther away.

[28] We assume that two-thirds of the residents are unskilled (group 0) and one-third of the residents are skilled (group 1). This split aligns with the national share of the population 25 years and over who have a bachelor's degree or higher, reported in the 2015-19 American Community Survey.

[29] These approximations are based on data from the 2015-19 American Community Survey about the median annual earnings for the U.S. population aged 25 years and older, broken up by education level. The median earnings are approximately $24,000 for less than high school graduates, $31,000 for high school graduates, $54,000 for bachelor's degree recipients, and $74,000 for graduate or professional degree recipients.

[30] Overall, this implies only a 15 percent reduction in the number of commutes, less than the 30 percent we considered in the analysis previously. We retain this lower number to keep the exercise transparent. Reaching a perhaps more realistic share of 30 percent as previously would require some WFH for the other groups of residents and a less transparent thought experiment.

[31] In part, this milder flattening of the bid-rent curve reflects a smaller aggregrate share of WFH, 15 percent instead of 30 percent previously. With homogeneous residents, a share of 14 percent of WFH lowers the elasticity of housing prices with respect to distance to 0.0796 instead of 0.106 with heterogeneous residents.

[32] We do not claim that our simple model explains all of these price dynamics. There are, of course, many other macroeconomic factors that led to the aggregate price level dropping early in the pandemic and then rising shortly thereafter.

[33] Total seats on domestic U.S. routes in summer 2022 reached over 90 percent of their summer 2019 level (OAG 2022) and hotel occupancy was above 85 percent of its 2019 level (STR 2022). Survey evidence indicates that domestic travel was back to 63 percent of pre-pandemic levels by October 2022 (Global Business Travel Association 2022).

[34] One factor that has been rumored to be keeping all of these groups from visiting city centers is an increase in crime and homelessness. Some of this is attributed to the de-densification of city centers, which made the homeless population more visible. The increase in crime is also attributed to exogenous factors such as reduced police presence after the Black Lives Matter protests in the summer of 2020 that questioned policing practices. While policing decisions are mostly exogenous, we expect that these deterrents will abate as downtowns re-densify with office workers and tourists. In a process to that of the return of service amenities, the re-densificiation of downtowns will reduce crime in a virtuous cycle that will attract more visitors.

Notes (Continued)

[35] If we were to endogenize amenities, the suburban shift in amenities would be amplified by the residential response of households moving to the suburbs, particularly if these households are the more affluent households with greater disposable income to spend on consumer services.

[36] Positive effects of WFH are also reported by Barrero, Bloom, and Davis (2021b) for workers' self-assessed productivity. Etheridge, Wong, and Tang (2020) use a similar source of information for U.K. workers and report on average no difference in self-assessed productivity between home and the workplace. On the other hand, Bartik et al. (2020) report sizeable negative productivity effects associated with WFH of about -20 percent. The employee surveys conducted by Morikawa (2020, 2021) in Japan suggest an even stronger decline in productivity of about 30 percent mid-2020, early in the pandemic. This drop in productivity was still about 20 percent a year later.

[37] Dingel and Neiman (2020) flag that less than 40 percent of occupations are good candidates for WFH.

[38] We note that in the field experiment of Bloom et al. (2015), workers selected for WFH were still coming to the workplace one day a week.

[39] Past literature has emphasized complementarities between different modes of communication (Gaspar and Glaeser 1998; Storper and Venables 2004) and provided suggestive evidence for these complementarities (Charlot and Duranton 2006; Battiston, Blanes i Vidal, and Kirchmaier 2021). A fairly high elasticity of substitution between WFH and work from the office is not inconsistent with these findings, but quite the opposite. Face-to-face and other forms of communication were previously all taking place in the workplace. With a greater prevalence of WFH, much remote communication can now take place from home while important face-to-face communication may still take place overwhelmingly in the office.

[40] Delventhal and Parkhomenko (2022) raise the possibility that the shock was more of a preference shock than a technology shock.

[41] While the estimate of the substitutability between remote and in-person work seems large, assuming a lower elasticity would imply a larger productivity gain for WFH.

[42] Although these productivity gains need not be as high as those we have experienced in the last ten years with easy and fairly high-quality "face-to-screen" communication and ubiquitous file, information, and data sharing, they may be hard to achieve as many tasks remain difficult to conduct well remotely.

[43] The same argument implies a lot of heterogeneity across workers in their WFH decision.

[44] Emanuel and Harrington (2023) also find that less productive workers elect to work from home, perhaps a strong reason behind the WFH stigma.

[45] Negative selection into WFH, for example, could decline in a post-COVID environment.

[46] Mothers of young children are only one such group.

[47] Urban economists usually justify the existence of cities by highlighting the productivity advantages associated with a greater concentration of workers into larger and denser cities. For an introduction and a discussion of the latest developments, see Duranton and Puga (2020). Duranton and Puga (2004) and Behrens and Robert-Nicoud (2015) provide in-depth discussions of the theoretical foundations of agglomeration mechanisms while Combes and Gobillon (2015) propose an extensive review of the empirical literature. Most of what follows in this section builds on the content of these papers.

Notes (Continued)

[48] The first reason is that measuring specific agglomeration channels is difficult. A "thick" local labor market is easy to conceptualize but much harder to measure. These channels may also intermix in practice. Input-output linkages that are potentially more regional in scope may find their ultimate cause in direct interactions between executives of different firms located in close proximity. Second, the importance of these specific channels in explaining outcomes such as workers' wages or firms' productivity must be causally measured against all other possible confounding channels. Third, we must also establish how agglomeration measured by, say, city population or density, fosters these different channels. Estimating this type of relationship is also fraught with simultaneity concerns. Results from studies that look at a single channel for agglomeration effects tend to grossly over-account for agglomeration effects. When summing the shares of agglomeration effects that various studies claim to explain, the total vastly exceeds 100 percent because of confounding factors.

[49] We also conjecture some complementarities between local amenities and agglomeration effects. The main reason behind this conjecture is that the same highly skilled workers at the origin of local amenities that emerge to serve them are also the main emitters and benefactors of agglomeration benefits through face-to-face interactions. In that case, the loss of amenities and agglomeration effects may reinforce each other, but perhaps only within a limited radius.

[50] These statements are not meant to be interpreted normatively. The choice of working from home when in-person work generates positive agglomeration benefits implies that workers will work from home too much relative to what is socially desirable. However, since we expect the effects of WFH on agglomeration benefits to be modest, the inefficiencies at play are also likely to be modest.

[51] Growth in income per person for the United States was 2.1 percent per year on average over the period 1950–2010 (U.S. Bureau of Economic Analysis 2019).

[52] To affect the urban landscape more profoundly, we would need this effect to differ across cities. It is true that the share of jobs that can be conducted remotely varies across metropolitan areas and increases with their density. Althoff et al. (2022) report a perhaps 20 percentage point difference in WFH between the densest and least dense commuting zones in the United States. But this difference only implies a 2 percent difference in productivity loss between a city with 20 percent of workers working from home and one with 40 percent. This will hardly make a dent in the productivity advantage enjoyed by the likes of New York or San Francisco.

[53] Ellen and Kazis (2022) study the issue in New York City. They conclude that only a small fraction of office buildings can be converted into housing. Both hard physical constraints and regulatory and legal obstacles explain this result. At the same time, the stock of possibly permanently vacant office space is so large that conversions could lead to a flow of new housing in New York City comparable to what has been added through new construction in the recent past.

[54] Considering the case with multiple income groups for which the increase in housing price is stronger will put even more pressure on urban expansion.

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Flexibility & Conversions in New York City's Housing Stock: Building for an Era of Rapid Change

Ingrid Gould Ellen and Noah M. Kazis

OVERVIEW

- The COVID-19 pandemic triggered a sharp fall in demand for commercial space in New York City, with the stickiness of the work-from-home model preventing a rebound as the crisis receded. Meanwhile, demand for residential space swiftly recovered, driving sales prices above pre-pandemic levels.
- Given these market dynamics, the authors consider the feasibility of converting commercial space to apartments as a means of expanding the city's housing stock and improving housing affordability.
- If 10 percent of the city's office and hotel spaces were repurposed, the authors estimate that 75,000 homes could be created—equivalent to a 2 percent increase in the city's housing stock, or four times the average annual number of new homes completed in the city in the past decade.
- Such conversions, however, would have to overcome considerable obstacles, including a slew of regulatory barriers. Allowing greater flexibility in building uses could help facilitate these shifts.

For American cities, the only thing that seems certain about the twenty-first century is its unpredictability. The first two decades of the century have already been a roller coaster for cities, especially New York. The century opened with the September 11 attacks, fueling worries about the impact of terrorism on the future of cities. Those fears were quickly overtaken by concerns about over-dependence on the financial industry in the wake of the Great Recession and then anxiety about climate change after Superstorm Sandy. The most recent challenges to New York City are the COVID-19 epidemic and the work-from-home trend that it spurred, which threatens the vitality of the city's commercial centers. Even after the pandemic becomes endemic, it is hard to imagine that demand for office space and hotels will return to previous levels. The city's retail sector has meanwhile suffered a secular decline as the popularity of e-commerce has grown. And yet, but for a few short periods after the September 11 attacks and the start of the COVID-19 epidemic, residential demand has remained robust throughout these crises.

Given these shifting market conditions, conversions of commercial space into apartments may be a critical tool for

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https://doi.org/10.59576/epr.29.2.53-74

adaptation. Among other things, conversions could offer a modest but important tool for increasing the overall housing supply—thereby helping to improve housing affordability—and also for creating a stock of very low-cost homes, along the lines of single room occupancy (SRO) units. However, regulatory barriers currently limit how many potential conversions will occur and push those conversions toward the construction of luxury rather than affordable housing.

Could the office buildings of Midtown Manhattan create the next generation of lofts? Should the future of New York City include more mixed-use districts that include office space and hotels, as well as a new brand of homes in converted commercial buildings? And can such conversions provide a meaningful path to increasing the supply of market-rate and affordable housing alike? These questions go well beyond the scope of this paper.

Rather, our objective is to understand the potential scope of such conversions, to identify the barriers that might inhibit them, and to call for regulatory flexibility, where appropriate, to enable the built environment to adapt as demand shifts, in both predictable and unpredictable ways. Such reforms might include reducing the distinction between short- and long-term uses, rethinking the separation of uses embedded in the city's zoning code, and considering a new subsidy tool to encourage the creation of affordable homes through conversions.

1. Changing Demand and the Need for Flexibility

The COVID-19 pandemic dealt a significant blow to New York City's commercial districts, as COVID-related shutdowns compelled businesses to allow nonessential employees to work from home. More than two years since mandatory shutdowns were instituted, the temporary flexibility employers provided is proving to be sticky and may potentially be triggering more permanent shifts in demand, as office workers have become accustomed to the ease and flexibility of working from home and some firms have used remote work to shed costs. A New York City Partnership survey of 160 major employers in New York City in spring 2022 found that only 38 percent of their employees were coming to work on a typical day (Partnership for New York City 2022). Nor do businesses expect a full return to the office.[1] The employers surveyed by the New York City Partnership projected that the percentage of workers in the office would rise, but only to about half by September 2022, and 22 percent of the surveyed employers anticipated reducing their footprint (Partnership for New York City 2022). Some of this reduction in office space was driven by businesses planning to shift operations out of the city altogether, likely to suburban locations. The survey found that 8 percent of businesses anticipated reducing their head count in New York City, mostly because of the high cost of doing business in the city. But the vast majority of businesses surveyed expected to continue to operate in New York City, albeit under hybrid work arrangements. Of course, many workers, especially those earning less, do not have the luxury of working from home. But in office-focused commercial neighborhoods, such as New York City's central business districts, the impact could be considerable. Indeed, the working-from-home trend poses a particular and longer-term threat to New York City's commercial sector, which has thrived on dense agglomerations of activity (Duranton and Handbury, this volume).

The soft commercial real estate market reflects this expectation. Assessed values of office buildings fell by an average of 17 percent citywide between 2020 and 2022 and by 23 percent in

Manhattan's office districts. Perhaps surprisingly, the reductions were nearly identical across Class A and Class B properties, though we do see somewhat smaller reductions in the assessed value of trophy buildings and also in commercial districts in Brooklyn and Queens.

It also seems unlikely that business travel will quickly return to previous levels, as many firms may have come to appreciate virtual meetings as a far less expensive substitute for in-person gatherings. Thus, even as COVID-related travel and meeting restrictions lift, the demand for hotel rooms and large meeting spaces seems likely to remain depressed. While tourism seems on track for a stronger recovery, in cities like New York that have traditionally enjoyed high volumes of business travel, hotels are likely to see reduced demand for many years. The lingering threat of the pandemic may also lead more travelers to opt for renting private homes through short-term rental platforms rather than hotels, to the extent that regulators allow such rentals.

The retail sector has meanwhile suffered a longer-term secular decline as e-commerce continues to surge and people spend less at brick-and-mortar retail establishments. Online sales in the United States rose from just $5 billion in 1998 to $571 billion in 2019, then skyrocketed to $815 billion in the first year of the pandemic (Brewster 2022). E-commerce accounted for more than 14 percent of total sales in the first quarter of 2022 (FRED 2022). While retail will continue to adapt to e-commerce by enhancing the customer experience, investing in strategies to complement online purchasing (Gramling, Orschell, and Chernoff 2021), and converting to uses that require an in-person presence, such as restaurants and bars, personal care establishments, and urgent care clinics, there is likely to be less demand for traditional retail spaces going forward. The geography of that demand may also shift, with increases in residential neighborhoods and decreases in commercial districts as more office workers spend weekdays at home.

Alongside what seems to be a long-term decline in demand for office, hotel, and retail space, demand for residential space in New York has rebounded to pre-pandemic levels. Residential rents recovered to first-quarter 2020 levels in the summer and fall of 2021, and median home sale prices were about 17 percent higher in each of the city's five boroughs in the fourth quarter of 2021 than they were in the fourth quarter of 2019. It appears that many people want to live in New York City, even when they don't have to regularly go to an office in the city. As urban amenities return, demand may increase further. Indeed, it is possible that the demand for urban neighborhoods will actually grow as more people working from home hunger for interaction outside the home (Brooks 2021; Ellen and Hempstead 2002).

In light of these market dynamics, the conversion of commercial space to apartments could be a critical tool to increase the stock of housing to meet residential demand and improve housing affordability.[2] Certainly, there are likely to be individual buildings that are ripe for such conversion. In some cases, as with hotels, commercial buildings could feasibly be turned into subsidized affordable housing, including as supportive or SRO housing. Indeed, some of the most prominent early supportive housing developments in New York City were previously SRO hotels.

In contrast, the conversions of many large office buildings would likely be targeted to higher-income households. Their large floor plates encourage the development of larger luxury apartments, while their tall heights, concentration in expensive central neighborhoods, and lack of individual kitchens and bathrooms increase conversion costs. Still, there are older and smaller office buildings that could be converted to more modestly sized and priced apartments. Further, even if office conversions produce higher-end homes, the creation of those homes can still help to make more lower-priced homes available in the future. Most of today's affordable

housing was yesterday's new market-rate housing. Buildings depreciate and become less expensive over time (Rosenthal 2014). Even in the short run, the creation of new market-rate homes can expand the availability of affordable housing through a process of chain migration (Mast 2021). As higher-income households move into the new units, they vacate their previous homes, opening new options for another household, which will, in turn, vacate its original home (and so on), ultimately making more units available in lower-rent neighborhoods.

Conversions of nonresidential space have long shaped New York City's housing stock. Back in the 1970s, as demand for manufacturing space fell, New York City saw many industrial spaces converted into residential lofts in neighborhoods like Soho and Tribeca. Many of these conversions initially happened illegally but have since been legalized, and a recently approved rezoning aims to regularize these units further (allowing non-artists who own artist-restricted lofts to pay a fee to convert them to legal residences). There were challenges to converting these older manufacturing buildings to residential spaces, but such conversions produced many new homes. This type of loft conversion also helped create vibrant, mixed-use, neighborhoods both in New York City and in cities across the country.

Likewise, programs that encouraged the conversion of office space to residential use are often celebrated for revitalizing Lower Manhattan. In the 1990s, Lower Manhattan's older building stock had become unattractive to office tenants, and vacancy rates in the overwhelmingly commercial neighborhood stood at around 20 percent. A set of zoning changes and financial incentives, including tax abatements for the conversion of office towers to mixed or residential uses, led to the conversion of more than 10 million square feet of space (New York City Independent Budget Office 2018). While the neighborhood lacks economic diversity, and it is not clear whether these incentives were necessary to spark the transition into a mixed-use, 24-hour neighborhood, there is substantial agreement that this transition has made Lower Manhattan a more resilient and lively neighborhood, for office workers and residents alike.

Compared with demolition and new construction, conversions can take less time, cost less money, produce a lower environmental impact, and provoke less "not in my backyard" (NIMBY) opposition. At least some of the NIMBY objections to new housing concern the height, bulk, and design of new buildings, which existing residents charge are often out of character and scale with the existing community. To the extent that new housing is created through the conversion of structures that already exist, community opposition should be reduced. Further, conversions typically take place in commercial districts with relatively few neighbors and even fewer lower-income residents; so fears about new homes and residents triggering gentrification will generally be limited.

Yet there are barriers to such changes in use. Economists have written volumes about the cost of NIMBYism and regulatory barriers that limit the construction of new housing. The existing research has focused almost exclusively on restrictions on physical structures, focusing on how regulations limit buildings' height and density and ultimately the amount of space that can be built. The research shows that such restrictions constrain developers' ability to construct new buildings in response to increases in demand, leading to higher prices and rents and reductions in welfare (Glaeser, Gyourko, and Saks 2005; Gyourko and Molloy 2015; Glaeser and Ward 2009; Saks 2008; Hilber and Vermeulen 2016; Turner, Haughwout, and van der Klaauw 2014). The existing research has paid far less attention to use zoning, or the regulatory barriers that limit how owners can *use* their properties. Such usage rules were in fact one of zoning's primary functions originally, with the stated legal purpose being to separate uses and protect residential communities from noxious

Table 1
Estimated Distribution of Floor Space
Building Square Footage

Borough	Office	Hotel	Retail	Storage, Factory, and Other Commercial
Brooklyn	87,367,796	6,439,666	73,834,345	242,576,601
Bronx	45,163,047	1,744,003	31,613,572	117,432,910
Manhattan	474,614,379	64,305,817	105,718,585	225,257,141
Queens	49,210,534	10,021,548	59,532,944	225,590,954
Staten Island	13,134,382	626,144	15,426,060	35,219,046
Total	669,490,138	83,137,178	286,125,506	846,076,652

Sources: New York City Department of City Planning (DCP) MapPluto 21v4; NYU Furman Center.
Note: Hotel area is calculated as total building area less retail, office, other commercial, and residential area.

uses (Hirt 2014). Such separation was arguably important when it meant separating homes from polluting factories. As is the case with many static regulations, however, technological changes and shifts in market conditions make many of those original justifications far less compelling.

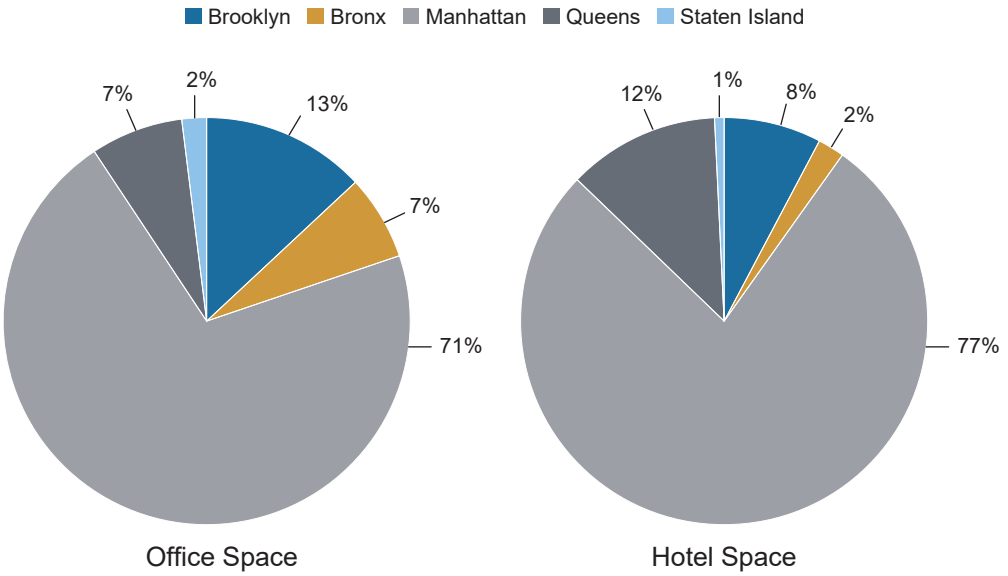
Insofar as land use regulations constrain the ability to convert properties from one use to another, they may impede cities from reinventing themselves and adapting for the next era of city life. Today, conversions may help cities like New York adapt to a market transformed by two years of a pandemic—the focus of this paper. Tomorrow, it may be climate change (or something entirely unexpected) that necessitates a more flexible approach to regulating the city's buildings. More than ever, policymakers need tools to help make the building stock more flexible and adaptable, or at least to remove obstacles that hinder such adaptation.

2. Conversion Opportunities in New York City

Table 1 shows the estimated distribution of interior space in New York City by sector, based on data from the Primary Land Use Tax Lot Output (PLUTO) data set created by the New York City Department of City Planning. At the end of 2021, we estimate that the city had 3.5 billion square feet of residential space, 669 million square feet of office space, 83 million square feet of hotel space, 286 million square feet of retail space, and another 846 million square feet of storage, factory, and other space.

Even if demand for office and hotel space remains depressed, we don't expect to see wholesale conversions of the stock. Rather, commercial rents and hotel room rates will fall, and the market will get closer to an equilibrium. Where rents fall low enough, though, property owners will find the costs of converting to residential space worthwhile. Research suggests that many office workers will settle into three-day-per-week in-office schedules (Bloom, Han, and Liang 2022). This will not lead firms to reduce their footprints by a full 40 percent, though, given the realities

Chart 1
Distribution of Office and Hotel Space across the Five Boroughs



Sources: New York City Department of City Planning (DCP) MapPluto 21v4; NYU Furman Center.

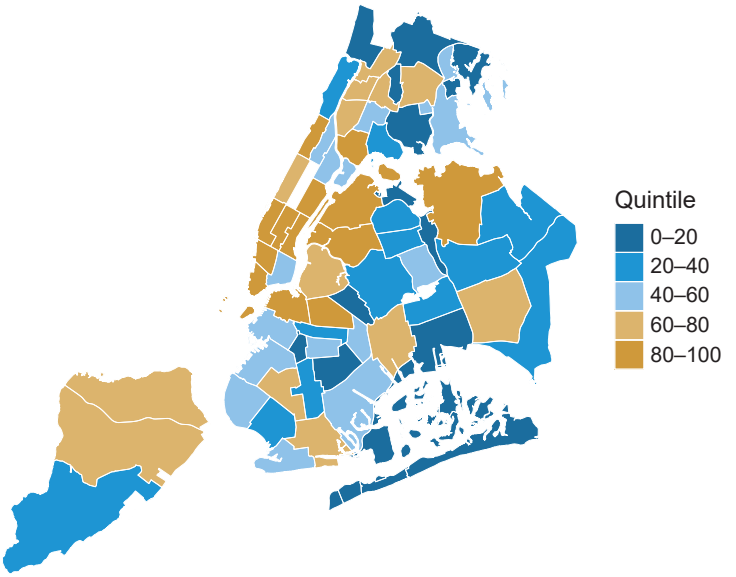
of office layouts, the frictions of workers sharing space, and flexible schedules that mean that more than 60 percent of workers will likely be in the office on any given day. We assume a much more modest reduction of 10 percent. Assuming that 10 percent of office and hotel space was converted to residential space, this would produce another 75 million square feet of residential space. The current 3.5 billion square feet of residential space houses close to 3.5 million units. Assuming a similar average of 1,000 square feet per unit, the new space could produce another 75,000 homes. While this would only amount to a 2 percent increase in the city's housing stock, it amounts to four times the average annual number of homes completed in the city through new construction in the past decade. That would not be insignificant. And of course, it is possible that more of the commercial stock could be converted if workers and firms truly settle into a two-day-per-week in-office schedule. If one-third of hotel and office space were converted to residential use, for example, that could produce another 250,000 homes.

It is worth emphasizing that office and hotel space is not evenly distributed across the city's five boroughs. Chart 1 shows the geographic distribution of office and hotel space across the city. Both sectors, unsurprisingly, are concentrated in Manhattan, which boasts nearly 71 percent of the city's office space and 77 percent of its hotel space. Converting 10 percent of that 535 million square feet of Manhattan real estate could result in a 6 percent increase in residential space in the borough, concentrated in Midtown, which is currently one of Manhattan's least residential areas. This could represent a meaningful shift in the character of the neighborhood, one that would likely require additional changes. For example, such an increase might call for additional schools, grocery stores, and other residential amenities in Midtown, facilities that could potentially be incorporated into distressed retail spaces. Manhattan's dense transit infrastructure could surely support this additional population, since it was already successfully handling significant, and now reduced, commuting flows between Midtown and other parts of the metro area.

Exhibit 1

Total Office Square Footage

By Community District



Sources: New York City Department of City Planning (DCP); NYU Furman Center.

Note: Area is calculated as the sum of office area in any building, regardless of the primary use.

As noted above, these conversions are not likely to produce much affordable housing, absent government incentives, and some properties are not appealing targets for conversion to affordable housing under any reasonable incentive program. Could the market-rate housing they produce spark fears about gentrification? Exhibit 1 shows a map of office space concentrations across the city's community districts, indicating that central and Lower Manhattan boast the largest concentrations of space. The people living in and near these districts are overwhelmingly high income, and the low-income households that do live nearby reside in subsidized housing. Thus, any new homes produced in these areas should spark minimal fears about gentrification. Rather, the discussion about affordability should emphasize the price worth paying for integrating affordable units into these high-income neighborhoods. The office districts in downtown Brooklyn and Long Island City may be somewhat closer to lower-income neighborhoods, but generally these office districts have not seen the same decline in value. Between 2020 and 2022, market values of office buildings fell by an average of 10 percent in Long Island City and 14 percent in downtown Brooklyn, compared with average declines of 23 and 22 percent in downtown and Midtown Manhattan, respectively.

As a measure of the feasibility of commercial-to-residential conversions in the past, Table 2 shows the estimated number of residential units added over the past decade in New York City through conversions of nonresidential space, which we identified through job alteration filings. In total, just under 10,000 homes were created through conversions from office space, hotels, industrial space, institutional space, warehouses, and "other"

Table 2
New Units by Initial Occupancy Type (2012-2020)
Net Change in Class A Units across Job Filings Where Occupancy Changes to Residential

Job Type	Initial Occupancy	Proposed Occupancy	Units, Net Change
Alteration	Commercial	Residential	5,850
Alteration	Unknown/Miscellaneous	Residential	2,355
Alteration	Educational/Institutional	Residential	720
Alteration	Industrial	Residential	549
Alteration	Storage	Residential	511

Sources: New York City Department of City Planning (DCP) Housing Database 2020; NYU Furman Center.

spaces. Office buildings produced 5,850 homes. (We lack the complete data on conversions of hotel space needed to specify the number of homes created from hotels.) By contrast, roughly 140,000 homes were created through new construction, suggesting that about 4 percent of homes in New York during this period were created through conversions of office space.

At the current conversion rate, it would take over a century to convert 10 percent of the city's office space into residential homes. It is possible that conversions will speed up now that market conditions have changed, but understanding whether regulatory hurdles are slowing the pace of conversion is important.

3. Regulatory Barriers

3.1 Background: The Decreasing Flexibility of Land Use Law

While conversions remain an important and constant aspect of our land use system, land use law has become, over the long term, decreasingly accommodating of this sort of flexibility. As zoning codes and other land use regulations have become more detailed and more prescriptive, opportunities for quick and simple changes to land use have become scarcer. Take, for instance, the example of loft conversions mentioned earlier. In New York City, legalizing the residential use of abandoned warehouses and industrial spaces required the creation of an elaborate new regulatory apparatus—the Loft Law—with its own administering agency and system for adjudicating disputes, its own rules and regulations, and its own standards for regulating housing conditions and permissible rents (New York Multiple Dwelling Law 2022). The Zoning Resolution now provides a special category of use for joint living-work quarters for artists, which requires a process for official city certification of who qualifies as a working fine artist (New York City Department of City Planning 2022d).

But a portion of this complication could have been avoided under an earlier land use regime. Prior to 1961, New York City (like all cities at zoning's inception) operated under a system of cumulative zoning, in which "lighter" uses, such as residential, were permitted in all districts that allowed heavier uses, such as commercial or industrial. After 1961, though, New York switched to a noncumulative system, in which industrial uses are generally prohibited in residential districts *and* residential uses are barred from industrial zones. Converting warehouses to livable lofts would not have been easy prior to 1961—many still lacked basic requirements for habitability, including heat and water—but the shift to a more prescriptive zoning system added an extra series of obstacles that would not have existed before.

The move toward noncumulative zoning is relevant to current conditions insofar as it prevents some hotels built in manufacturing districts from converting to residential use (it is not directly a barrier to office-to-residential conversions in New York City). But this is just one example of many in a shift toward a highly detailed and very prescriptive system of zoning regulations, especially in big cities like New York. The city's original 1916 comprehensive zoning regulation was fourteen pages long (as transcribed today) (City of New York Board of Estimate and Apportionment 1916); today, it runs to 3,476 pages, including appendices (New York City Department of City Planning 2022a). Each additional layer of detail reduces the likelihood that the standards under which a structure was originally built and used will be the same as those that apply to a potential new use.

For example, that original 1916 zoning code applied the same height regulations—and usually the same limits on lot coverage and setbacks—regardless of what use a building was put to. So long as the new use was permitted, a conversion usually would not require changes to the building's structure. Today, however, different standards apply to different uses. New York City hotels built with the required twenty-foot rear yard usually cannot easily convert to a residential use, which requires a thirty-foot rear yard, without chopping off a slice of the building (New York City Department of City Planning 2022c). In special districts, zoning can be so bespoke and prescriptive that uses and designs are planned down to the individual building level, leaving still less flexibility.

Often, the increasing complexity of the zoning code—and the concomitant difficulty of easily converting a building to a new function—reflects the increased capacity of urban planners to administer a complicated scheme and the growing number of social goals that zoning now attempts to promote, from encouraging the provision of fresh food to raising capital for accessibility improvements to transit. Even the most prescriptive schemes—districts that are essentially master-planned—have their own important advantages, including an ability to work with developers on site-specific frameworks that couldn't be applied broadly.

Other rigidities of land use law stem from reasonable efforts to manage transitions of regulatory standards over time. For example, zoning generally allows nonconforming uses to remain in operation, so long as they do not change dramatically thereafter. Many other building and housing codes similarly grandfather in certain conditions that would not be permitted in new construction. Doing so is often entirely reasonable: It acknowledges that new construction can be designed with modern regulations in mind, whereas existing uses cannot necessarily be easily (or fairly) brought into compliance. But as each of these codes is updated and strengthened over time, the gap between grandfathered uses and compliance can grow

significant, discouraging any change that would trigger new compliance requirements (Nash and Revesz 2007). For example, many have identified contemporary accessibility standards as an obstacle to converting hotels to residential use; the change of use would trigger costly upgrades that continued operations would not. It can be hard to make small changes to a building, including a change of use, without being required to undertake extensive changes. Each land use regime has its own mechanisms for managing the transitions from old to new regulatory requirements—some more carefully calibrated than others—but the incentive to avoid a change of use can still discourage many conversions.

In some instances, though, the inflexible nature of local land use laws is nearly impossible to justify. New York City's regulations governing SRO housing provide an extreme example—and given the frequent use of hotels as SROs, an example that is relevant to the focus of this paper. Starting in the 1950s, New York City imposed a slew of policies meant to eliminate SROs, which were perceived as offering unacceptably poor living conditions that blighted neighborhoods (Sullivan and Burke 2013). Among these was an outright ban on the construction of new, unsubsidized SROs. By the 1980s, realizing that this regulatory strategy had decimated the city's lowest-rent housing stock and exacerbated homelessness, the city reversed course entirely, instituting an outright moratorium on the conversion of SROs (this moratorium was later struck down by the courts and replaced with alternative mechanisms to preserve the existing stock of SROs) (Sullivan and Burke 2013). But New York City did not repeal the earlier ban on creating new SROs. Thus, city policy reflects the apparent belief that New York City had precisely the right number of SROs as of the mid-1980s, in precisely the right locations: neither adding nor removing any private SRO is to be permitted. This is a remarkably prescriptive approach to land use regulation, and a somewhat silly one. However unlikely it was that New York City had exactly the right set of SROs in the 1980s, that simply cannot have remained true across four decades of dramatic change.

Extreme cases notwithstanding, our goal is not to assess the aggregate effect of a less flexible land use regulation system, much less to provide a guide as to the flexibilities worth keeping. Each inflexibility was added for a reason, and some of those reasons were quite important ones. Even so, it is important to recognize that compared to the systems in place at zoning's birth, contemporary land use law provides many more obstacles to changing the use and operation of an existing building.

3.2 Regulatory Barriers to Post-COVID Commercial Conversions

As already discussed, in the wake of the COVID-19 pandemic, there has been immense interest in the possibility of repurposing commercial spaces for residential uses. Mayor Eric Adams, notably, made a promise to convert 25,000 hotel rooms (mostly outside Manhattan) into affordable housing a centerpiece of both his election campaign and his affordable housing plans (Dugan 2021).

While some commercial-to-residential conversions have proceeded over the last two years, the pace of conversions has been slower than some anticipated (or hoped). A thicket of local regulatory barriers may have contributed to this slow pace, with many sites unfriendly for conversions for one reason or another. More than a third of newly built

hotels in New York City were constructed in manufacturing districts where residential uses are not allowed, for example. As already mentioned, residential uses require deeper rear yards than commercial uses do, precluding the conversion of many hotels built to the commercial standard. Density regulations limit the number of separate apartments permitted within a building, potentially precluding the conversion of small hotel rooms into apartments on a one-to-one basis. And a change of use would trigger many new building-code requirements—chief among them improvements to accessibility for people with disabilities—that could require extensive renovations. Many conversions would have been possible only after an extended rezoning process and/or costly and slow renovations (Kazis, Appel, and Murphy 2021). However, the precise effect of these regulatory barriers is not clear; the amount of market demand for conversions, absent these regulations, is not known. And while hotel-to-housing conversions have proven quite successful in states like California, the New York City context presents special obstacles; rooms are much smaller than elsewhere and very few extended-stay hotels with pre-existing kitchens are available for the easiest conversions.

Office-to-residential conversions face different issues. Generally, offices are so unlike residences that gut renovations are required for any conversion: They will need different layouts, but also different plumbing and electric and gas connections. While rules governing buildings' size and shape will limit some office-to-residential conversions, such regulatory barriers pose a lesser obstacle to these conversions. For example, in New York City, residential uses are permitted in all districts zoned for offices, eliminating another barrier facing some hotel conversions. Market forces are likely to play a more central role in determining which buildings will pursue such conversions. (One important feature of this market, relative to hotels, is the long term of office leases, which kept many buildings stable through the pandemic and will make it more difficult for owners to put office buildings into a conversion-ready condition.)

Notably, though, housing quality standards do shape the type of housing produced by office conversions. Bedrooms require windows, unlike offices. Accordingly, residential buildings are generally built with shallower floor plates than offices; newer office buildings, in particular, are designed to have especially deep floor plates. Geometrically, then, offices are more easily converted into large apartments, where internal spaces can be joined into larger rooms or used for "home offices" and other uses that don't require windows. It may be very difficult, architecturally, to convert offices into smaller apartments (many projects even involve structurally removing existing floor area to create narrower buildings or new courtyards). In turn, this may make converting offices into subsidized housing especially difficult, given the terms and financial structure of many subsidy programs.

In New York, many of these barriers have recently been addressed for a subset of hotels, pursuant to new legislation. Under a state law passed in June 2022, New York City hotels can be converted to permanent affordable housing, notwithstanding any otherwise-applicable regulatory barriers, so long as the city housing department approves and various conditions are met. (These conditions include being located within 400 feet of a zone permitting residential uses, receiving union consent where hotel workers are collectively represented, and meeting specified affordability levels.) How many projects are able to take advantage of this law remains to be seen, but it represents an important shift in the state's strategy. Notably, though, it applies only to hotels, and only to a subset of them. For example, the owner of one Midtown hotel reached a tentative deal with a supportive housing developer to convert the property to

more than 500 affordable and supportive housing units, but the deal was vetoed by the hotel workers' union. The lack of union support is expected to prevent the conversion of most large Manhattan hotels (the most unionized segment of the industry) into housing.

Previously, New York's efforts to legislatively streamline the conversion process as a strategy for producing affordable housing were essentially unsuccessful. In 2021, legislative leaders and the governor's office each proposed strategies to allow immediate conversions of certain hotels and offices to affordable housing residential use, notwithstanding many state and local laws. The legislature took a different approach, however. In the 2021 Housing Our Neighbors with Dignity Act (HONDA), New York State provided funds for the acquisition of commercial properties and their conversion to permanently affordable housing but no regulatory relief (and indeed added substantial new conditions on the types of conversion that would qualify for funds) (Kazis, Appel, and Murphy 2021). Although the state made $100 million available, a year later it had received only two preliminary proposals and no formal applications for HONDA funds (Mellins 2022).

4. Policy Solutions

Flexibility is hardly an unalloyed good (Super 2011), and the shocks of the COVID-19 crisis should not cause policymakers to overweight the need for quick shifts in use over other important values (including the predictability and clarity of rules). Still, the events of the past two years do point to certain opportunities for rethinking current land use regulations that may unduly reduce regulatory flexibility in contexts where it can be needed. This is hardly a comprehensive list of either ways to improve the flexibility of the building stock or lessons that could be learned from this pandemic era. Rather, these suggestions represent the type of re-evaluation that may be necessary moving forward (and, to some extent, informed the state's recent legislation permitting hotel conversions).

4.1 Reduce Distinctions Between Short-Term and Long-Term Residential Uses

Across an array of regulatory spaces, contemporary law tends to distinguish between short-term and long-term residential uses: hotels and apartments. It is not clear that this distinction uniformly supports good housing policy. The sharp divide between short-term and long-term residential uses is an ahistorical one. As American cities grew in the nineteenth and early twentieth centuries, a more continuous spectrum of housing options was common, operating under such names as boarding houses, rooming houses, and apartment hotels (Groth 1994). Such arrangements served important functions for poor, middle-class, and wealthy urbanites alike. The same is true today; extended-stay hotels, for example, have become an important housing option for many Americans, especially low-income families facing housing instability.

But too often, those lines create artificial distinctions. For example, New York City does not generally allow long-term residential uses in industrially zoned hotels, but it does allow the same hotels on the same sites to be leased out as homeless shelters, which are functionally

another, less stable form of residence. Indeed, many calls to convert hotels into affordable housing have run up against the obstacle that, in effect, those hotels are already under contract as affordable housing, as part of the shelter system. (Serving as shelter may be more profitable than conversion to long-term affordable housing in many cases as well.) It is not immediately obvious what land use planning purpose is served by allowing one type of housing but not the other in the same location. Meanwhile, such laws impede the use of hotels as SRO-style housing—eliminating a potentially affordable housing option—and leave many households stuck in poor shelter conditions.

It would be inadvisable to immediately eliminate all distinctions between short-term and long-term residential uses. Entire regulatory apparatuses and policy programs have been built on that foundation, from property taxes to the homeless shelter system. Still, the COVID-19 crisis has exposed the arbitrariness of these lines. The recent state legislation permitting certain hotel-to-housing conversions appears to recognize that hotels can, at times, already provide habitable housing options. This moment of clarity should be a call to further investigate how to better use hotels as housing (and perhaps housing as hotels).

4.2 Consider More Pathways to Compliance

Regulatory transition costs associated with changes in use or redevelopment may pose a barrier to flexibility in housing supply. As already discussed, when incremental changes to building use trigger extensive new regulatory requirements, it can lock in existing uses. Land use law already provides an array of options for managing the process of regulatory transition, and policymakers seeking to encourage the flexible use of the city's building stock should pay close attention to these options for regulatory transitions. Many aspects of the codes take the clearest positions: either simply grandfathering in existing uses or requiring universal compliance. But these are not the only choices. Many laws phase in over time, allowing a period of transition during which capital improvements can be planned and implemented. Others create special processes to allow easier conversions of target properties. Article I, Chapter 5 of the New York City zoning code, for example, allows commercial properties to convert to residential use more easily if they were built prior to 1961 (or 1977 in Lower Manhattan) and located in the neighborhoods nearest the city's central business districts. The city's Loft Law managed the transition from industrial to residential space by creating a schedule tying permissible rent increases to different stages of conversion while allowing residential uses in the interim.

Each of these tools might help facilitate commercial conversions. In cases where old buildings have fallen far behind contemporary standards but are unlikely to be entirely replaced with new construction, incremental pathways to compliance may prove useful (as might requiring or allowing existing buildings to upgrade to a lower standard than the requirements that would apply to new construction). And in cases where land use law already permits such alternative pathways to compliance, policymakers should be sure to update their applicability as appropriate. When it was first enacted, Article I, Chapter 5 allowed for easier conversions of buildings that were twenty years old; should it today allow for conversions of buildings constructed in 2001 rather than 1961?

4.3 Rethink the Separation of Uses

The separation of uses—residential, commercial, and industrial, along with subcategories of use within each—is traditionally at the heart of American zoning. New York City's zoning code, like most in the United States, is "Euclidean"; it regulates both the size and the use of a building (and a number of other things besides). Beginning in the 1980s, some architects and planners began to call for "form-based codes" instead. Such codes remove most restrictions on the use of a building to instead prioritize architectural standards (that is, "physical form"). Many cities have moved toward a form-based approach, including big cities such as Miami, Denver, and Nashville. While the distinction between use-based and form-based zoning is easily overdrawn—at least in big cities, zoning rarely abandons all attention to either use, bulk, or architectural form—it represents a difference in priorities.

Likewise, European zoning codes rarely fully separate residential and nonresidential uses, instead determining as a matter of course that certain commercial and even industrial uses are not only compatible but complementary with residential development (Hirt 2014). American zoning stands apart for the rigidity of its separation of uses. And while New York City's zoning code is much friendlier to both mixed uses and adaptive re-uses than many American jurisdictions, it still defines permitted uses with an exacting level of detail.

The experience of the past two years may suggest an appetite for continuing to deprioritize the separation of uses as an organizing principle of zoning in New York City. First, the possibility of commercial-to-residential conversions generated enough excitement for the state legislature to allow existing hotels to be used as residences in some industrial districts. Allowing industrial uses in residential zones might still generate intense opposition. But especially if the state's hotel conversion law proves successful, there could be room to move further toward a system that permits more housing in industrially zoned areas.

Second, the widespread adoption of work-from-home arrangements over the past two and a half years may indicate that the exclusion of many commercial uses from residential zones is outdated. The pandemic taught us that commercial and residential uses can (and occasionally must) coexist in much closer proximity than traditional zoning always allows. Further, increasing attention to the idea of the "fifteen-minute neighborhood" (one in which most basic needs can be addressed within a fifteen-minute walk from a resident's home) suggests a growing interest in such mixed-use districts, due to both shifting preferences and climate considerations (Steuteville 2021). While many low-impact home-based businesses are permitted in New York City, many limitations apply, including a requirement that home occupations be accessory to a residential use (New York City Department of City Planning 2022b). Not all of these limitations seem strictly necessary in a Zoom (or WeWork) world. Might not a studio apartment be rented out as an individual's office space? Could a second individual be allowed to join someone in their living room to formally work from "home" together?

Thus, the pandemic experience has highlighted two areas where New York City may have overly required the separation of uses: the general prohibition of residences in industrial zones and specific prohibitions of commercial uses in residential zones. These can be paired with the city's usual willingness to allow residences in commercial districts and other methods of encouraging mixed-use development. Is there room for a broader rethinking of use zoning?

In answering these questions, planners will need to carefully consider the special circumstances facing the city's central business districts. While there are many advantages to mixed-use, live/work neighborhoods—as demonstrated by recent changes in Lower Manhattan—the city's commercial strength has been built on the intense agglomeration economies in its central business districts, which exist not only at the city level but in sub-neighborhoods and even block-by-block. Indeed, the city's 2017 rezoning of East Midtown was specifically intended to rebuff the encroachment of residential uses on the city's commercial core in order to protect those small-scale agglomeration effects (New York City Department of City Planning 2017). In now considering how to *allow* increased residential development in Midtown, more thought is needed about how remote work and other changes have affected the geographic scale at which these agglomerations operate and how to value the protection of overwhelmingly commercial areas.

4.4 Consider When to Abandon Normal Procedural Protections

At times, it may be necessary to act much more expeditiously—and with fewer safeguards—than government is accustomed to doing. A comparison between California's and New York's approaches to hotel conversions during COVID-19 provides an illustration. California received much acclaim for its Project Homekey, a program to convert commercial spaces (especially hotels) into permanent housing for people at risk of homelessness. Project Homekey was created in June 2020; by May 2021, it had created 6,000 units of housing. Notably, the per unit cost of this housing was less than $150,000; by contrast, the average cost of a new unit of affordable housing in California in 2016 was $425,000 (Office of Governor Gavin Newsom 2020; Terner Center 2020). Some of Project Homekey's success can be attributed to its speed (which in turn stemmed from the state's need to meet tight federal deadlines for the use of COVID-19 relief funds). California exempted Project Homekey developments from local zoning entirely, as well as from the normal permitting and environmental review processes. It also provided projects with enough funds to fully fund the conversion work up-front, allowing them to avoid the slow process of coordinating multiple funding streams and arranging complex financing packages.

In contrast, New York State passed no legislation to promote commercial-to-residential conversions until June 2021, a full year after Project Homekey kicked off. HONDA, discussed above, provided funds for commercial-to-residential conversions but no regulatory relief. The path New York initially chose, of retaining all the normal procedural protections while attempting to promote conversions, failed to generate any housing. Now, New York has followed California in more broadly allowing immediate conversions of hotels, removing most pre-existing state and local regulatory barriers, but it may have missed the moment of greatest opportunity.

To be clear, California's aggressive actions might not have sufficed to generate the same results in New York, even had New York acted quickly. California could convert extended-stay hotels and motels with footprints that lent themselves to easy apartment conversions; many already had kitchenettes. New York City's extra-small (and high-rise) hotels are not so amenable to conversion under any regulatory framework. But conversely, California surely

would not have achieved its results without its aggressive regulatory strategy. At times of rapid change, equally rapid action may be necessary. Local approvals, impact analysis, and community participation each have their place in a land use system, but so, too, may knowing when to abandon them.

4.5 Consider a Subsidy to Encourage Conversions to Affordable Housing

Given the mounting evidence about the long-term benefits that lower-income children glean from living in economically integrated neighborhoods, there are good reasons to foster neighborhoods that are not only mixed use but also mixed income. But conversions are not cheap. Absent financial incentives, they would likely produce little or no affordable homes, with office conversions in particular tending toward large and high-end residential use. Consider that the financial district, which has transitioned to a mixed-use neighborhood in part through conversions of office buildings, had a median income in 2019 that was more than two and a half times larger than that of the city as a whole, and a poverty rate that was less than half the citywide rate. Indeed, given the property tax system in New York City, there are questions about whether even market-rate rentals, as opposed to condominiums, would be created absent some financial incentives. While increasing the supply of market-rate apartments (rented or owned) would help to increase affordability in the city, it would mostly make homes at the higher end of the market more affordable. Thus, as the city thinks about remaking its office districts, it should consider the possibility of subsidizing the creation of affordable homes in conversions, whether through a new program or the application of existing funding streams to these projects.

4.6 Consider How Rent Regulation Affects Long-Term Flexibility

Rent regulation—by design—reduces the flexibility of the city's buildings. It does so through multiple channels. In currently rent-regulated residential buildings, the tenure protections for tenants ensure lower turnover of units and preclude landlords from unilaterally redeveloping or repurposing a property. These prohibitions limit building owners' ability to convert away from residential uses (not a pressing issue under current market conditions). Additionally, recent changes to New York's rent stabilization law limit landlords' ability to increase rents in connection with building-level improvements. This may reduce building owners' interest in certain investments, including those related to climate resiliency. Finally, to the extent that new, or newly residential, buildings are included in rent-regulation schemes, this will likely discourage some owners from shifting buildings toward residential use by reducing potential returns. Proposed "good cause eviction" legislation in New York, which includes a functional cap on rent increases even in newly created homes, could have this effect, depending on the ultimate details of the scheme. Any effort to increase the flexibility of the building stock must be aligned with rent-regulation programs to ensure that conversions can be financed without undermining the intent of those schemes; conversely, rent-regulation programs should be designed with an eye toward the way the building stock must grow and change over time.

5. Extending Flexibility: The Case of Climate

This paper has focused on one context—the most immediate—where a more flexible approach to the use and regulation of buildings may be necessary: the response to COVID-19. But cities have always faced the need to adapt to changes both foreseeable and unknowable. Climate change is likely to bring both. Climate bears mentioning to underscore that the kinds of flexibility described above are not only responsive to an era-defining pandemic, but may be valuable more broadly.

Climate change is likely to require enormous changes to the way we design, use, and operate buildings. In New York City, rising sea levels will bring one set of challenges to low-lying coastal areas; the growing frequency and intensity of storms will bring another, overlapping set of concerns related to flooding (in other regions, fires may be the primary concern). At the same time, the imperative to reduce greenhouse gas emissions from buildings—which in New York City is now a legal obligation for most large buildings—will require substantial renovations and systems upgrades, as well as changes to operations.

Dealing with these challenges poses many concerns analogous to recovering from COVID-19. For example, code standards aimed at ensuring flood resistance apply to newer buildings but not to older existing buildings. Improving those grandfathered buildings' climate resilience will require the same kind of careful construction of pathways for regulatory compliance and coordination with rent-regulation programs as will allowing commercial-to-residential conversions. Likewise, as one response to flood standards that leave ground floors unusable as residential space in flood-prone areas, New York City has recently allowed the introduction of commercial spaces on those ground floors: another case where the stringency of use zoning has been mitigated in response to new policy demands. (Indeed, this came as part of a broad resiliency-focused effort to add flexibility throughout all aspects of the zoning of coastal areas.) Reworking the city's building stock to reduce climate emissions will require its own set of adaptations, especially as the need to reduce emissions from existing buildings is paired with the separate climate goal of encouraging dense and transit-oriented development. It will be necessary to consider policies that facilitate each of these transitions, along with policies to facilitate the transition from under-utilized commercial space to in-demand housing.

6. Conclusion

As New York City (hopefully) looks beyond the worst phases of the COVID-19 pandemic, demand for residential space has recovered quickly, while demand for commercial space remains depressed and may remain so for the long term. Yet, to date, the conversion of office and hotel space to homes has not been a significant feature of the recovery. At least in the case of hotel-to-housing conversions—perhaps somewhat less so for offices—regulatory barriers to conversion have likely played a role in preventing a shift in use to accommodate current conditions. This reflects the generally inflexible nature of New York City's land use law, which, as standards proliferate, has become more prescriptive. With COVID-19 serving as a stark reminder of how quickly the needs of urban life can shift, we suggest that cities like New York

need to become more comfortable with allowing the built environment to quickly shift as well. Allowing and even encouraging greater flexibility for the use of existing buildings could be an important first step. The city should also consider new subsidy tools to ensure that conversions produce not only high-end housing but also some set of affordable homes.

Notes

Acknowlegements: The authors thank Elisabeth Appel for excellent research assistance and Andrew Haughwout, Matthew Murphy, Elizabeth Propp, Mark Willis, and an anonymous referee for extremely helpful comments on an earlier draft.

[1] The impact on productivity remains unclear. Experts debate the degree to which people working from home will find it easier to slack off or learn less from casual and unplanned encounters with their co-workers.

[2] Cities' experiences with devastating storms and pandemics also underscore the need for buffer spaces that can be used when such disasters hit, though these spaces are not the focus of this essay. Disasters may be particularly destabilizing to lower-income households and households of color, which often lack the savings and resources to easily weather disruption. Home-sharing platforms could help to connect people to temporary places to stay, but this might require cities to relax restrictions on short-term rentals. Under-utilized hotels and government buildings could also be reconfigured with this flexibility in mind. During the pandemic, many cities turned to empty hotels to house people experiencing homelessness or who tested positive for COVID (Colburn et al. 2020).

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The Promises and Perils of Racial Equity Planning

Lance Freeman, Ph.D.

OVERVIEW

- The COVID-19 pandemic has sparked a reassessment of land use planning and regulations that could result in major changes to New York City's built environment.
- This article explores the use of racial equity analysis—studies that consider the disparate effects of planning actions by race—as a means of addressing inequalities caused by past and current land use regulations.
- As an illustration, the author details an analysis conducted as part of the redevelopment of Brooklyn's Gowanus area. The analysis concluded that the proposed new development would reduce racial inequities.
- The article describes the benefits of racial equity planning, but cautions that such a tool could also be used to promote NIMBYism and thwart development in general.

The COVID-19 pandemic has prompted a reconsideration of approaches and actions regarding land use regulations and planning. This reassessment could result in big changes to New York City's built environment. Is there a role for racial equity planning in ensuring that any such changes are done equitably? This article considers the use of racial equity analysis as a tool to remedy the racial inequality that has been structured into the built environment through past and ongoing discriminatory and racially insensitive land use regulations and planning.

Racial equity analysis or planning refers to the use of planning studies in a way that explicitly considers whether there are disparate impacts by race resulting from planning actions. The logic behind racial equity analysis is analogous to the logic that underlies regulations requiring environmental impact statements (EIS): Just as other types of large-scale projects that cannot be built as-of-right (in other words, without review and approval by relevant authorities) are required to produce EIS to aid in understanding how the environment will be affected by development, racial equity analysis will help us understand how large-scale planning projects affect racial equity.

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The views expressed in this article are those of the author and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System. To view the author's disclosure statement, visit https://www.newyorkfed.org/research/epr/2023/epr_2023_racial-equity_freeman.

https://doi.org/10.59576/epr.29.2.75-87

The article begins by briefly describing the exclusionary history of land use planning in the United States, the legacy of these practices, and the ongoing need to explicitly address racial inequality. It then describes the case of the Gowanus Neighborhood Plan, a mixed-income development in Brooklyn, New York, and the racial disparity report that was crafted by myself and others as a way of examining how the project affected racial equity. Lastly, it discusses the promise, perils, and limitations of racial equity planning.

1. Land Use Planning in the United States

The historical roots of land use regulation and zoning in the United States underscore the need to explicitly consider the racial equity impacts of large-scale planning projects. The desire to exclude and separate "undesirable" populations from those more fortunate and powerful was present at the genesis of planning and zoning in the United States. From the use of explicit racial zoning in southern and border-state cities to the Supreme Court's sanctioning of Euclidean zoning—which separates land uses by type (residential, commercial, retail, industrial) and was justified as a means of keeping "parasitic" apartment buildings out of single-family districts—zoning has been used as a tool to exclude (Hirt 2014).

Since the successes of the civil rights movement and the passage of fair housing laws, zoning's exclusionary intentions have become more muted. For example, low-density single-family zoning is presented as a way to keep incompatible uses out of a neighborhood, rather than as a tool for keeping low-income minorities at bay (Einstein, Glick, and Palmer 2022). Putative race-neutral land use policy is the order of the day. Nevertheless, zoning and other land use policies and regulations still have the effect of perpetuating segregation and economic inequality (Einstein 2020; Trounstine 2018).

The paradigm of race neutrality is also present in other urban development activities, especially those related to economic development. Cities have pursued economic growth without consideration of its distributive consequences for race. Instead, the assumption has been that economic growth or housing production would trickle down to people of all races. The failure of a race-neutral approach to address the chasm of racial inequality is evidenced by the persistent racial wealth gap as well as the residential segregation that remains stubbornly high in many cities (Darity and Mullen 2020; Logan and Stults 2021). To overcome both ongoing and historical legacies of discrimination and segregation, the implications for racial equity must be considered during governmental decision-making processes. The scope of such analyses could include how the costs and benefits of any action are distributed across racial/ethnic groups, the risks of displacement disaggregated by race/ethnic group, and how the proposed development would relate to current patterns of residential segregation.

2. Gowanus Neighborhood Project

The Gowanus neighborhood redevelopment project in Brooklyn was the site of a pilot racial equity analysis in 2021. In this section, I briefly describe the redevelopment project and the analysis that was undertaken as a way of illustrating what a racial equity analysis might look like. I am not proposing that this is the ideal type of racial equity analysis or that this approach cannot be improved upon. I have included it here simply for purposes of illustration.

The proposed project is a mixed-income development that will produce some 8,495 housing units, of which roughly 3,000 will be affordable (Paul, Freeman, and Kelly 2021).
New York City, through legislation sponsored by Jumaane Williams, Public Advocate for New York City, and Rafael Salamanca, chair of the City Council Land Use Committee, adopted a new requirement to consider racial equity in land use policymaking through a racial disparity report. The racial equity analysis conducted for the Gowanus project examined the distribution of the market-rate and affordable units by race/ethnicity, how the development will affect residential segregation locally and citywide, and the risks of displacement. It also considered the economic impact of the project, including anticipated changes in businesses and employment opportunities and how these changes will manifest for different racial/ethnic groups.

The Gowanus area of Brooklyn attracted industry in the nineteenth century due to the ease of accessing the harbor from the waterways in the area. With the completion of the Gowanus Canal in 1869 and the improved access the canal provided, the neighborhood became a locus of manufacturing. The industrial uses and combined water/sewer system that dumped raw sewage into the canal during periods of heavy rainfall created severe pollution in the waterway.

Because of New York City's continued prominence as a center for the arts, finance, media, and information technology, many city neighborhoods have experienced substantial gentrification. With the cleanup of the Gowanus Canal, the Gowanus neighborhood has become part of this trend. The area has witnessed an influx of higher-income households, and housing prices for both owner-occupied and rental units have increased substantially in recent years (Paul, Freeman, and Kelly 2021).

The Gowanus Neighborhood Plan was many years in the making. The local Community District Six in Brooklyn had requested a study to develop a plan to help the community realize its ambitions for the neighborhood's future. The outcome was the Gowanus Neighborhood Plan, which the City of New York adopted in 2021. The plan includes the development of 8,495 housing units, of which 3,000 will be affordable to low- and moderate-income households. The plan also calls for mixed-use development, including commercial, industrial, and artist spaces. Significant investments in infrastructure will accompany the cleanup of the polluted Gowanus Canal (Paul, Freeman, and Kelly 2021). One of the outcomes of the plan was the rezoning of part of the neighborhood and implementation of the city's mandatory inclusionary housing (MIH) program, which requires that a significant component of new residential development be affordable to low- and moderate-income households. The housing affordability criteria are based on the U.S. Department of Housing and Urban Development's (HUD) area median income (AMI) and can range from 40 percent of the AMI to up to 115 percent of the AMI. The ambition is to create a mixed-used development that will provide opportunities for low- and moderate-income households to live in a high-opportunity neighborhood.

The racial equity analysis done for the Gowanus neighborhood consisted of three parts. First was an analysis of existing conditions and trends in the Gowanus area. Second, the racial equity impacts of the proposed housing component of the new project were considered. Last, the analysis considered the racial equity impacts of the proposed economic development component of the Gowanus plan. (See Table 1 for a summary.)

Our analysis of existing trends included examining the extant land uses in the area. We also examined the demographic composition of the neighborhood, focusing on race/ethnicity. Since the City of New York by policy gives preference to residents who reside in the community district of the proposed development, we also considered how the demographics of those receiving preference would vary depending on which community districts were considered as part of the preference catchment area. We did this because the proposed Gowanus project sits near three community districts in Brooklyn—Community District Two, Community District Six, and Community District Seven—though it sits within Community District Six. The analysis of existing trends and conditions also looked at trends in median household income and housing rents and prices in the area. We also considered the extent to which households in the area had access to affordable housing and rent-regulated housing. This information is important for considering the risk of displacement that could occur due to rising housing costs. All of our analyses were disaggregated by race/ethnicity where possible, to ascertain the racial equity implications of the existing conditions and trends in the area. The existing conditions and trends analysis also looked at economic conditions, including educational attainment, employment, and the occupational profile of residents in the area. Finally, as part of the analysis of economic trends and conditions, we examined wage levels for jobs in the area and trends in employment opportunities in various industries located in the area. We relied on data from the American Community Survey, the Department of City Planning, the New York City Housing and Vacancy Survey, and the Longitudinal Employer-Household Dynamics produced by the U.S. Census Bureau.

The ambition is to create a mixed-used development that will provide opportunities for low- and moderate-income households to live in a high-opportunity neighborhood.

Our analysis of the racial equity implications of the proposed housing first examined the likely rent levels of the various units, including the market-rate units and the units at different levels of affordability under the MIH program. We then examined the racial composition of households that could likely afford rents at those various levels. This analysis included units that would be set aside for the homeless. The analysis took into consideration the various community district preference scenarios (Community District Six alone, Community Districts Two and Six, or Community Districts Two, Six, and Seven) that could be implemented.

As part of our analysis of the racial equity implications of the proposed new development, we also considered how the new development might affect existing patterns of residential segregation. We used the likely racial composition of the new development based on the analysis described in the previous paragraph to simulate how residential segregation patterns in Community District Six and New York City as a whole, respectively, might change as a result of the new development.

Table 1
Key Elements of the Racial Equity Analysis of the Gowanus Neighborhood Plan

Element	Goal	Aspects Assessed
Current conditions	Analyze existing conditions and trends in the area	Demographics
		Current land uses
		Household income, rents, prices
		Access to affordable and rent-regulated housing
		Educational attainment, employment, and occupational profile
		Wage levels in the area
		Trends in employment opportunities in industries in the area
		How demographics would vary based on what districts were included in the focus area
Housing impact	Examine racial equity impact of the housing component of the planned development	Likely rent levels
		Racial composition of those who could afford rents at the likely rent levels
		Effects on existing racial segregation
Economic impact	Assess racial equity impact of the economic development component of the planned development	How employment in different industries in the area might change
		Racial composition of employees in those industries

The final component of our racial equity analysis looked at the economic implications of the proposed development. This part of the analysis examined how employment in different industries might change due to changes in the existing land uses. It also took into consideration the racial composition of the employees in these industries.

The overall conclusion of the racial equity analysis for the Gowanus Neighborhood Plan was that the new development would serve to reduce racial inequities (Paul, Freeman, and Kelly 2021). This is primarily because in recent years the Gowanus neighborhood has become relatively affluent and can be considered a high-opportunity neighborhood. The neighborhood is disproportionately white and middle-and upper-income. The MIH component of the proposed development, however, would provide access to this neighborhood for relatively low-income households. Because Blacks and Hispanics are overrepresented among low- and moderate-income households, the proposed development would increase the proportion of Blacks and Hispanics in the Gowanus neighborhood. This means, from a distributional perspective, that a disproportionate share of the benefits of the new development would go to Blacks and Hispanics, relative to their representation in the surrounding neighborhood. Because the Gowanus neighborhood is now disproportionately white relative to the rest of the city, the new development would also reduce patterns of residential segregation by increasing the proportion of Blacks and Hispanics in the neighborhood. Moreover, the Black population in the Gowanus neighborhood is currently concentrated in the public housing developments in the area. The new development would increase the number of Black persons living outside of public housing within the Community District and consequently would also reduce segregation within Community District Six.

This pilot study offers an example of how a racial equity analysis could be conducted. One challenge to undertaking the analysis was the paucity of neighborhood-level data with which to study the impacts of the proposed development on different racial and ethnic groups. A requirement of the new racial equity law adopted by the City of New York is that the Department of City Planning make available additional data at the neighborhood level disaggregated by race and ethnicity. Availability of such data should facilitate more fine-grained analyses of the impact of proposed developments in terms of racial equity.

3. The Promise, Perils, and Limits of Racial Equity Planning

3.1 The Promise

Racial equity planning such as that required by New York's Local Law 78 represents a bold attempt to, at least in the domain of planning, move beyond a race-neutral approach and attempt to explicitly address racial inequities. It stands in direct contradiction to Supreme Court Chief Justice John Roberts' argument that "The way to stop discrimination on the basis of race is to stop discriminating on the basis of race." In that court case, a Seattle school district took the race of students into account when assigning students to schools, a practice that some parents claimed discriminated against white students. Theoretical arguments aside, what can we expect from the law, and what risks does the implementation of such laws pose?

Ideally, racial equity would be used as a tool to ensure that historically marginalized groups are not unduly harmed by planning actions and, to the extent possible, that opportunities for these groups are enhanced. Thinking through the mechanics of what planning does, we can begin to envision the implications of this action. The power to plan typically derives from a state's police power; states are called upon to use this power to protect the health, welfare, and well-being of residents, or what is sometimes referred to as the public good. The comprehensive plan, or some otherwise similar action or document, is where localities set out what the public good is and how the city aims to ensure it. Clearly, this would be an instance where racial equity analyses are warranted and would hopefully head off important racial inequities. For example, zoning ordinances that effectively exclude Black people and people of color from large swaths of a city due to large economic disparities between white, Black, and Latinx households would easily be identified for what they are, racially exclusionary policies. Policymakers could more easily be taken to task for adopting such policies if these inequities were documented in a racial equity report. The siting of parks and other open spaces disproportionately in white neighborhoods would also be evident if racial equity analyses accompanied comprehensive planning. Racial equity reports would provide those advocating for racial justice with the evidence necessary to push for more inclusive communities.

Another opportune time for racial equity analyses is when planners engage in discretionary acts—proposing measures that deviate substantially from the existing plan/zoning ordinance or represent a major change to the built environment. In New York City, these include changes to the city map, the mapping of subdivisions, the designation of or a change in zoning districts, special permitting within the zoning ordinance, landfills, urban renewal projects, the site selection of

capital projects, and the acquisition or sale of city-owned land. These types of projects are subject to Uniform Land Use Review Procedures (ULURP) and would also require a racial equity analysis. In Boston, which has also adopted racial equity planning, these include residential projects or mixed-use projects that include housing that are undergoing "large project review" (in other words, projects that add at least 50,000 square feet of gross floor area, projects of varying size near Boston Harbor, and large projects that involve a significant change of use without new construction) and/or are part of a Planned Development Area. In Boston and New York, projects that trigger those cities' respective planning review processes must undergo racial equity analyses. Other cities have similar criteria for triggering planning review. Such projects generally were not anticipated when extant plans or zoning were adopted. Because projects that trigger review were not previously evaluated under the extant zoning or plans, conducting racial equity analyses at this juncture provides the opportunity to review these plans for racial equity.

Thus, the review process often represents a critical component of the overall planning process. But comprehensive plans are undertaken infrequently; New York City has not redone its zoning code since 1961. These reviews thus represent a point at which the community can consider the type of built environment that is desired.

As Einstein, Glick, and Palmer (2020) show, it is during these review processes that opponents of new development, whom they call neighborhood defenders, engage in a plethora of actions to delay and sometimes kill projects. Moreover, the neighborhood defenders are disproportionately white homeowners who understandably seek to advance and preserve their own interests. Consequently, the interests of historically marginalized groups are often disadvantaged during these review processes. As Einstein, Glick, and Palmer write: "Lacking the time, sense of efficacy, and knowledge to participate, renters and other unrepresented voices stay home. Moreover, even those that do show up may find themselves intimidated by neighborhood defenders' high levels of expertise. Most importantly, potential supporters have little incentive to show up at neighborhood meetings" (p. 144).

New York City has not redone its zoning code since 1961. These reviews thus represent a point at which the community can consider the type of built environment that is desired.

This is a tragic irony. The large project review in Boston, ULURP in New York, and other planning review processes that allow for citizens' input were developed and implemented, in part, as a means of giving communities some say against powerful planning "czars" like Robert Moses and rapacious developers (Rohe 2009), and a way to redistribute power from the powerful to the powerless. But too often that is no longer the case. Einstein, Glick, and Palmer conclude: "Instead of providing voice to underrepresented residents, planning and zoning board meetings amplify the voices of older, white homeowners" (p. 146). Although the authors are unable to document conclusively that race is a motivating factor, they do provide circumstantial evidence that suggests race is indeed implicated in many of the instances where review processes are used to halt development.

Racial equity analyses, if invoked in these scenarios, could perhaps serve to advance the interests of disadvantaged communities if it were shown that these communities would receive a disproportionate share of the benefits or if the project served to lessen racial inequities in some way. This might provide additional political momentum to support a proposed development. If the political objective is to reduce racial inequities, more information illustrating how proposed planning actions are related to these inequities should provide a first step toward this end.

The adoption of racial equity analyses in planning would also complement the affirmatively furthering fair housing (AFFH) requirements of the Fair Housing Act of 1968. There is considerable debate and difference of opinion between Democratic and Republican administrations on interpreting the meaning of the AFFH. Recently, Democrats have appeared to hew more closely to the spirit of the law, which sought to ameliorate decades of racial discrimination and the ensuing segregation in America's neighborhoods. Republicans appear more comfortable with a "race-neutral" approach, such as HUD's direction under Secretary Ben Carson when an attempt was made to implement AFFH by focusing on exclusionary zoning and the development of affordable housing (U.S. Department of Housing and Urban Development 2020). But whatever the political winds at the moment, it is clear that the law calls for some type of proactive planning to overcome enduring spatial inequality. Racial equity analyses could be helpful in both instances. In the case of a race-conscious approach, racial equity analyses are perhaps the type of actions envisioned by the framers of the Fair Housing Act. Racial equity analyses would explicitly consider how planning actions affect racial equity, including impacts on segregated housing patterns. But even in the case of a more race-neutral approach, racial equity analyses provide a framework for considering how planning actions are related to inequities in the built environment.

3.2 The Perils

In this discussion of racial equity planning as a tool to address the inequities that plague many American cities, I would be remiss if I failed to consider possible unintended consequences of the use of this tool. The most apparent pitfall associated with the adoption of racial equity analysis would be its use as a tool to further stymie new development, including that which might serve to address racial inequities. As a number of activists, policymakers, and scholars have argued, regulations of the built environment have been used for NIMBY purposes (Einstein, Glick, and Palmer 2020). Typically, new development that deviates from what is allowable under the extant land use regime must undergo some type of review. As described above, this is the point at which I would suggest that considerations of racial equity be put into effect.

The review process provides a window through which community planners and other stakeholders can ensure that allowing deviation from existing regulations is warranted. But that window can also be used to delay and even deny new developments. Sometimes new developments are denied based on the merits. But sometimes delaying can also serve to deny proposed developments. Requesting additional studies, disputing such studies, and engaging in other delaying tactics can increase the cost of proposed development to an extent that the developer simply cannot complete the deal. Einstein, Glick, and Palmer (2020) document how neighborhood defenders use these review processes to stymie proposed development. They describe how these defenders attempt to persuade planning board members to oppose new development, use real or feigned

expertise to point out the shortcomings of proposed projects, and threaten to, or do, file lawsuits claiming that the opposed development does not comply with all laws and regulations.

These efforts are successful not so much because the neighborhood defenders are always accurate or correct in their interpretations of laws and regulations or that they are exceptionally prescient and capable of anticipating potential problems arising from new development, but because their participation in the process and their opposition can change minds and dash or slow down the development to an extent that costs rise and the development is no longer feasible.

Requiring a racial equity analysis would be another box that would have to be checked for a development to win approval. Certainly, the potential exists for "defender" types to use it as a tool to block proposed developments. Undoubtedly in some instances, blocking the proposed development would be warranted on any number of grounds, including the impacts on racial equity. But it is also possible that a racial equity analysis done in good faith that demonstrates benefits to the community in terms of reducing inequities might get rejected if opponents are able to use the requirement to slow down the development process. Opponents could make claims about the inadequacies of the racial equity analysis, dispute its findings, or find other technical details to dispute as a way of slowing down and in some instances killing the proposed development.

In early 2022, the *New York Times* reported how activists opposed to the expansion of the University of California at Berkeley campus are using the California Environmental Quality Act, intended to protect the environment, to slow down and perhaps stop that expansion.[1] While racial equity planning is intended to reduce inequities, could it also be similarly weaponized as an additional tool to combat all types of development?

But we should not let NIMBYism and anti-development threats cause us to shy away from attempting to address racial inequities head-on

Perhaps. But we should not let NIMBYism and anti-development threats cause us to shy away from attempting to address racial inequities head-on. Instead, "we should give serious thought to the way that new development occurs and how community input affects such development. It is beyond the scope of this article, and it is not my intention, to address in depth the strengths and weaknesses of the current land use regime in the United States. But I will take this opportunity to make the point that while community input is important, we should try to think of a way to incorporate it so that its impact can at least be anticipated by developers. Successful developers are entrepreneurial and can adapt to a variety of scenarios if they can anticipate beforehand what the possible conditions might be. It is the unexpected and unanticipated obstacles that can increase the riskiness of a proposed development and make costs prohibitive.

In many local jurisdictions, the comprehensive plan is where the communities' wants and desires for the built environment are spelled out. A comprehensive plan, as its name implies, should be comprehensive and, ideally, would be able to anticipate the needs and desires of the future as well. Perhaps it is in the formulation of the comprehensive plan where the battles over the built environment are best resolved. Undoubtedly, developing a comprehensive plan can be a long and contentious process. But a one-time battle, even if long and grueling, might be better than ad hoc revisions to out-of-date comprehensive plans that result in continuous

battles and negotiations for almost any new development. If a jurisdiction could create a comprehensive plan that is flexible enough to allow for different types of development, more "as of right" development could occur, the community's interests would be respected and represented, and developers would know beforehand what is and is not likely to be approved in a particular locale. During the comprehensive planning stage, issues related to racial equity, environmental concerns, and other factors could be taken into consideration. Ideally, this would produce a scenario where there would be less need for developers to deviate from the extant land use regulations. As a result, more of the development that would occur would be "as of right."

The scenario painted in the previous paragraph is perhaps idealistic. But idealism is sometimes the necessary motivator for innovation. My larger point is that we need to think of a way to allow for community input without its being excessively used as a NIMBY tool. If the aim is to reduce racial inequities, considerations of racial equity need to be a part of the development process.

3.3 The Limits

Racial equity planning is in its embryonic stages. It is unclear how widely adopted it will be, or how effective. We can hope that it will be adopted and will evolve to become a tool that truly does have an impact on persistent racial inequities. We can also hope that this occurs without unduly impeding much needed development in cities with especially tight housing markets. But we must acknowledge that even under ideal circumstances, racial equity planning alone will not erase America's legacy of discrimination and segregation. Particularly in older cities where residential segregation and racial inequities are highest, influences on new development by themselves can have only a small impact. Inequalities in health, education, and wealth will only marginally be affected by assessments of new development. Over the long run, however, viewing the planning of new development through a racial equity lens could have a cumulative impact that does become significant.

We must also recognize that, for the most part, in the United States, planning is a local jurisdiction activity. There is substantial racial and class segregation within cities. But as Trounstine 2018 shows, such segregation between cities has been increasing. Thus, if a city adopts racial equity planning but its neighbors do not, inequities between cities might even increase. This point underscores the fact that the political geography of most metropolitan areas is fragmented and does not easily lend itself to the type of integrated and regional approaches that would be necessary to break down interjurisdictional inequities.

4. Conclusion

Racial equity planning represents an effort to address head-on longstanding racial inequities in American cities. Boston, New York, and Seattle are a few cities that have taken up the challenge of using this tool to try to redress the legacy of racially discriminatory planning and land use practices of the past. Such an effort would appear to be long overdue. After a flurry of legislation and initiatives during and immediately after the civil rights era, most urban policy

adopted a race-neutral tone. The race-neutral approach, while not engaging in the egregiously racist practices of the past, has not eradicated racial inequity in American cities. Residential segregation, although decreasing, persists and racial gaps in employment, health, and wealth persist. Racial equity planning is one step toward overcoming these persistent inequities.

The racial equity report produced for the Gowanus Neighborhood Plan was a pilot study illustrating how a racial equity analysis could be undertaken. The study illustrated the feasibility of such an analysis and highlighted the need for better data to enable more fine-grained neighborhood analysis. The study also documented that planning efforts have the potential to make a positive impact on persistent racial inequities.

While the Gowanus study showed the potential positive impacts of such analyses, planners should also have the foresight to try to prevent these racial equity requirements from being weaponized to delay and deny new development, unless such outcomes are warranted by deficiencies in the proposed developments themselves.

Racial equity planning alone will not undo the legacy of centuries of racial discrimination. There are too many other domains where racial inequality manifests, and our metropolitan areas are too politically fragmented to allow for the type of comprehensive regional approach that would be necessary to completely eradicate racial inequities. Nonetheless, racial equity planning does have the promise to make a substantial dent in the racial inequities that plague our cities.

Note

[1] See, for example, "Berkeley vs. Berkeley Is a Fight Over the California Dream," *New York Times*, March 12, 2022, at https://www.nytimes.com/2022/03/10/us/uc-berkeley-student-housing.html.

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FEDERAL RESERVE BANK OF NEW YORK
ECONOMIC POLICY REVIEW

The *Economic Policy Review* is published by the Research and Statistics Group of the Federal Reserve Bank of New York. The views expressed are those of the individual authors and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System.

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